## BIOGRAPHICAL SKETCH

NAME: **Puttaswamy, Naveen**

POSITION TITLE: Assistant Professor

EDUCATION/TRAINING

| INSTITUTION AND LOCATION | DEGREE *(if applicable)* | Completion Date MM/YYYY | FIELD OF STUDY |
|---|---|---|---|
| St. Joseph's College, Bangalore, India | BSc | 04/2001 | Environmental Science |
| University of Mysore, Mysore, India | MSc | 02/2003 | Environmental Science |
| University of Saskatchewan, SK, Canada | PhD | 10/2011 | Toxicology |
| Natural Resources Canada, Ottawa, Canada | Postdoc | 04/2012 | Environmental Chemistry |
| Sri Ramachandra University (SRU), Chennai, India | Scientist | 09/2015 | Environmental Health |

**Personal Statement**

My career goal is to establish a *human biomonitoring and analytical facility* to support air pollution and health effect studies, train young researchers, collaborate with global health experts, and positively impact policies in improving the quality of life.

With my PhD training in *environmental toxicology and chemistry*, I moved back to India from Canada in 2012 to join the Department of Environmental Health Engineering (EHE), Sri Ramachandra University (SRU), as a Scientist to work in the fields of *exposure science* and *air pollution epidemiology*. This was a major shift from doing laboratory-based toxicity experiments to work in population based research. Prof. Kalpana Balakrishnan and other EHE researchers had just established the *Tamilnadu Air Pollution and Health Effects (TAPHE)* cohort of 1300 *mother-child* pair which was the first prospective cohort to study the effects of household air pollution (HAP) on birth weight and children's health in India. This gave an opportunity for me to develop skills in subject recruitment, field surveys and follow-up planning, exposure and health assessments. Based on my previous laboratory training, I designed the sampling and analysis plan for volatile organic compounds, polycyclic aromatic hydrocarbons (PAHs) and metals. In 2014, I was awarded the *Global Health Equity Scholars (GHES)* fellowship by the Fogarty International Center, NIH, for a project that assessed exposures to PAHs using urinary biomarkers in 60 rural adult women who relied on solid fuels for cooking. As part of the GHES fellowship, I underwent 2 months of laboratory training at UC Berkeley on sampling and analysis of airborne PAHs under the guidance of *Prof. Katherine Hammond* and *Prof. Kirk Smith*. This work is now completed and manuscript preparation is underway.

At present, I'm working as *Assistant Professor* in EHE at SRU and I'm the lead coordinator of biomarker core activities for the India site in a randomized Household Air Pollution Intervention Network (HAPIN) trial aimed at assessing the health benefits of clean fuel intervention among pregnant women, children and adult women across four diverse LMIC populations. The HAPIN biomarker core aims to evaluate a battery of 23 biomarkers linked to endothelial function, cardiovascular health, inflammation, oxidative stress and exposure to VOCs, PAHs and second hand smoke. As part of formative research, I participated in the method cross-validation for PAH metabolites with the *Laboratory for Exposure Assessment and Methods Development in Environmental Research* at Emory University in Atlanta. These results were presented at the recent ISES-ISEE annual meeting in Ottawa, Canada. Cross-validation for additional biomarkers including nicotine metabolites, 8oxodG, levoglucosan, and VOC metabolites is underway.


a) Balakrishnan K, Ghosh S, Gurusamy T, Sambandam S, Mukhopadhyay K, **Puttaswamy N,** Sadasivam, A RamaswamyP, Johnson P, Kuppuswamy R, Natesan D, Maheswari U, Natarajan A, Rajendran G, Ramasami R, Madhavan S, Manivananan S, Nargunanathan S, Saidam S, Natarajan S, Chakraborty M, Balakrishnan L (2018). Exposures to fine particulate matter (PM2.5) and birthweight in a rural-urban, mother-child cohort in Tamil Nadu, India. *Environmental Research*, 16, 524-531. PMID: 29227900.

b) Barnett-Itzhaki Z, Esteban López M, **Puttaswamy N**, Berman T. A review of human biomonitoring in selected Southeast Asian countries. *Environmental International*. 2018 116:156-164. PMID: 29684824.

c) Balakrishnan K, Sambandam S, Ramaswamy P, Ghosh S, Venkatesan V, Thangavel G, Mukhopadhyay K, Johnson P, Paul S, **Puttaswamy N**, Dhaliwal RS, Shukla DK. Establishing integrated rural-urban cohorts to assess air pollution-related health effects in pregnant women, children and adults in Southern India: an overview

of objectives, design and methods in the Tamil Nadu Air Pollution and Health Effects (TAPHE) study. *BMJ Open*. 2015; 5(6):e008090. PMID: 26063570.

d) **Puttaswamy N** et al Cross Validation of Biomonitoring Methods for Polycyclic Aromatic Hydrocarbon Metabolites in Human Urine: Results from the Pilot Phase of the HAPIN Trial in Tamil Nadu, India. ISEE-ISES Conference Abstract. *Environ Health Persp*. 2018, 1.

## Positions and Honors

### Positions and Employment

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|---|---|
| 2008 - 2011 | Graduate Teaching Assistant, Toxicology Centre, University of Saskatchewan, SK, Canada |
| 2011 - 2012 | Natural Sciences & Engineering Research Council (NSERC) Postdoc Fellow, Canada |
| 2012 - 2016 | Research Scientist, Department of Environmental Health Engineering, SRU, Chennai, India |
| 2014-2014 | Visiting Postdoctoral Fellow, School of Public Health, University of California, Berkeley, CA |
| **2016 - Present** | Assistant Professor, Department of Environmental Health Engineering, SRU, Chennai, India |

### Honors

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|---|---|
| 2009 - 2011 | Toxicology Graduate Scholarship, Toxicology Centre, University of Saskatchewan, Canada. |
| 2011 - 2012 | NSERC Fellowship, Natural Resources Canada, Ottawa, Canada |
| 2014 - 2016 | GHES Fellowship, Fogarty International Center and National Institutes of Health, MD |
| 2006 | Best Research Poster, Honorary mention, 33rd Aquatic Toxicology Workshop, Canada |
| 2003 | University 2nd Rank, University of Mysore, Mysore, India |
| 1996 | Sir William Wordsworth Award. Seshadripuram Boys' High School, Bangalore, India |

### Other Experience and Professional Memberships

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| Sep. 2014 | Workshop on Physiologically Based Pharmacokinetic (PBPK) Modeling and its Applications, Center for Human Health Assessment, *The Hamner Institutes for Health Sciences*, RTP, NC |
| 2008 - 2011 | Society for Environmental Toxicology and Chemistry (SETAC), Pensacola, FL |
| Nov. 2016 | WHO Human Biomonitoring to support chemical risk assessment. WHO Collaborating Centre, *Chulabhorn Research Institute*, Bangkok, Thailand. |
| Jun. 2017 | Health Sector Involvement in the Implementation of the Minamata Convention on Mercury. *WHO-SEARO* Meeting. Bangkok, Thailand |
| Oct. 2017 | Analytical Methods Training. Determination of mercury and other elements in cord blood, urine and hair samples. *Jozef Stefan Institute*, Slovenia |
| Feb. 2018 | Analytical Method Training. Determination of urinary PAH metabolites by LC-MSMS and ICAM, VACAM, CRP by MSD. *LEADER, Emory University*, Atlanta |

## Contributions to Science

1. *Characterizing air pollution exposures in rural and urban populations in India*

   Pregnant women and young children experience dual burdens from exposure to ambient and household air pollution. The Tamilnadu Air Pollution and Health Effects (TAPHE) cohort of pregnant women was the first in the country to examine exposure-response relationships between prenatal exposure to PM2.5 and birthweight. I worked as scientist in an interdisciplinary team that designed and established TAPHE cohort in Chennai. Experience gained has made me to appreciate the need for interdisciplinary research to address air pollution related disease burden in India. One of the objectives of TAPHE was to characterize and profile levels of air toxics in rural-urban kitchens at the time of cooking. I designed the sampling and analysis plan for air toxics in the TAPHE study and the manuscript is under preparation.

   a) **Puttaswmay N**, Srinivasan N, Sudhakar S, Mukhopadhyay K, Sambandam S, Thangavel G, Balakrishnan K. Exposures to Volatile Organic Compounds (VOCs) among Rural and Urban Households in Southern India in Relation to Primary Cooking Fuels. ISEE-ISES Conference Abstract. *Environ Health Persp*. 2018, 1
   b) Balakrishnan K, Sambandam S, Ramaswamy P, Ghosh S, Venkatesan V, Thangavel G, Mukhopadhyay K, Johnson P, Paul S*,* **Puttaswamy N**, Dhaliwal RS, Shukla DK. Establishing integrated rural-urban cohorts to assess air pollution-related health effects in pregnant women, children and adults in Southern India: an overview of objectives, design and methods in the Tamil Nadu Air Pollution and Health Effects (TAPHE) study. *BMJ Open.* 2015;5(6):e008090. PMID: 26063570.

2. *Characterizing exposures to select metals in pregnant women using biomonitoring approach*
   Metals of concern (i.e. As, Cr, Cd, Hg, Mn, Ni, Pb and V) were analyzed in cord blood and urine samples of 250 pregnant women to establish baseline estimates in a pilot survey in in Chennai, India. The study adopted HBM approaches and reports the *first estimates of metals in humans in India*. The findings will generate interest among scientific communities to undertake Metals in Humans using HBM approaches, as this is a neglected field of research in India. This work was completed in collaboration with Prof. Milena Horvat, Jozef Stefan Institute, Slovenia. *Manuscript preparation is underway*.

3. *Addressing the ecotoxicology of metals in wetland reclamation efforts of the Athabasca oil sands (AOS)*
   Creation of sustainable wetlands on tailings and coke (waste byproducts) was thought to be a sustainable reclamation option for the AOS operation in Alberta. My PhD work focused on the fate, speciation and toxicity of metals released from AOS operation. Through this work, metals of concern (i.e. Ni and V) were identified and their fate and transport, speciation and toxicity were characterized. Follow-up efforts now focus on understanding the long-term geochemistry of Ni and V in reclaimed wetlands in AOS region.

   a) **Puttaswamy N**, Liber K. Influence of inorganic anions on metals release from oil sands coke and on toxicity of nickel and vanadium to *Ceriodaphnia dubia*. *Chemosphere*. 2012 Feb, 86(5):521-9. PMID: 22138340.
   b) **Puttaswamy N**, Liber K. Identifying the causes of oil sands coke leachate toxicity to aquatic invertebrates. *Environ Toxicol Chem*. 2011 Nov, 30(11):2576-85. PMID: 21898553.
   c) **Puttaswamy N**, Turcotte D, Liber K. Variation in toxicity response of *Ceriodaphnia dubia* to Athabasca oil sands coke leachates. *Chemosphere*. 2010 Jul, 80(5):489-97. PMID: 20553931.

## Ongoing Research Support

RPPR41215 (Prime 34946), NIH Clasen, Thomas (PI) 11/01/2016

***Household Air Pollution and Intervention (HAPIN) Trial***

The primary aim of this project is to determine the effect of a randomized LPG stove and fuel intervention on health benefits among pregnant women, child and adult women in four diverse LMIC populations using a common protocol.

*Role: Subject key personnel (Biomarker core, 2016-ongoing)*

Balakrishnan, Kalpana (PI)

*BT/IN/UK/APHH/41/KB/2016-17, DBT (IN), MoES (IN), MRC (UK), NERC (UK)*

***Delhi air pollution: health and effects (DAPHNE) study*** 01/03/2016

The primary aim of DAPHNE is to understand the early life effects of air pollution in Delhi by estimating exposure-response relationships between ambient air pollution exposures and health effects (birth weight, acute respiratory infections in children < 2 years) and asthma exacerbations in adolescents aged 12-18 years.

*Role: Co-Investigator*

## Completed Research Support

5R25TW009338, NIH/Fogarty Riley, Lee (PI) 11/01/14-11/01/15

*Global Health Equity Fellowship*

The goal of this training grant (in collaboration with University of California, Berkeley) was to provide mentored training to post-doctoral candidates to develop capacities for independent research in thrust areas of environmental health in LMIC settings.

*Role: Fellow (2014-15)*

*Mentors:*
*Prof. Kirk Smith, University of California, Berkeley, CA, US*
*Prof. Kalpana Balakrishnan, Sri Ramachandra University, Chennai, India*

5/8/4-11/Env/CAR/07-NCD-I, Indian Council for Medical Research 03/01/10-09/01/15

Balakrishnan, Kalpana (PI)

*Tamil Nadu Air Pollution and Health Effects Study (TAPHE)*

The goal of this project was to launch pregnant mother-child and adult cohorts to establish exposure-response relationships for (ambient and household) air pollution in relation to birth weight, acute respiratory illness, chronic respiratory symptoms and lung function. The project also developed exposure models for application in on-going chronic disease cohorts and created bio-repositories for future exploration of gene-environment interactions.

*Role: Research Scientist (2012-2016)*

TOR-APW Ref. 2016/648096-0, World Health Organization 01/03/16-01/08/17

Dr. Krishnendu Mukhopadhyay (PI)

*Development of mercury exposure profile among pregnant mothers in Chennai, India: mercury human biomonitoring pilot survey*

Prenatal exposure to mercury puts the developing fetus at risk of neurodevelopmental diseases. A pilot human biomonitoring (HBM) survey of 250 pregnant women was undertaken to assess mercury in scalp hair, cord blood and urine to profile prenatal exposure in Indian population. This is the first population based HBM survey for mercury profile in pregnant women in India.

*Role: Lead Analyst and Co-Investigator*