

REPORT

REPORT ON PARTICIPATION OF THE ICMR INTERNATIONAL FELLOW (ICMR-IF) IN TRAINING/RESEARCH ABROAD.

1. **Name and Designation of ICMR-IF :- Dr.S.RAGHAVAN**, SCIENTIST-B
(CHEMISTRY)
2. **Address** : Air Pollution Division,
National Institute of Occupational Health
ICMR, Meghaninagar, Ahmedabad-380016.
3. **Name & Address of Professor/host institute:**
Prof.Dr.Stuart Batterman
Professor of Environmental Health Sciences and Civil and
Environmental Engineering; Center Director,
University of Michigan Center for Occupational Health &
Safety Engineering, Dept. of Environmental Health
Sciences, School of Public Health, University of Michigan,
1420 Washington Heights, SPH-II, City of Ann Arbor,
Michigan 48109-2029, USA
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4. **Duration of Fellowship: 01-01-2012 to 30-06-2012**
5. **Frontline Research in which training/research was carried out:**
Environmental Research-Air Pollution-Assessment of Diesel
Exhaust Particulates & Polycyclic Aromatic Hydrocarbons in high-
traffic zone of Detroit city and

Training on Sample processing and analysis of Polycyclic
Aromatic Hydrocarbons (PAHs)/Polychlorobiphenyls (PCBs)/Poly
Brominated Diethyl Ethers (PBDEs) in biological samples-
blood/fish.

6.HIGH LIGHTS OF WORK CONDUCTED AS ICMR INTERNATIONAL FELLOW

1. Techniques/expertise acquired:-

- A) I have successfully executed the pre-designed research project titled ***"Characterization of Diesel Exhaust Particles and associated Polycyclic Aromatic Hydrocarbons (PAHs) in high traffic zones in Detroit, Michigan"*** under the guidance of Prof. Dr.Stuart Batterman, Professor of Environmental Health Sciences and Civil and Environmental Engineering; Center Director, University of Michigan Center for Occupational Health & Safety Engineering, School of Public Health of University of Michigan, Ann Arbor city, Michigan, USA during 01-01-2012 to 30-06-2012 under ICMR International Fellowship for Young Bio-Medical Scientists for 2011-12. The report of this research project is enclosed here with.
- B) I learnt the techniques of "Sampling, Extraction and Analysis of Polycyclic Aromatic Hydrocabons in Environmental and Biological Samples" during the execution of above stated research project.

- C) I have also learnt the techniques of "sample processing and analysis of PAHs/PCBs/PBDEs in biological samples, e.g., blood and fish" by involving/helping in their regular research work (lab work) in the field of environmental health.
- D) I have given a lecture on "**Occupational and Environmental Health Research at NIOH (ICMR)**" at the School of Public Health, University of Michigan, Ann Arbor city on 9th March 2012. The audience comprising of Professors, research staff and doctoral students of the University of Michigan appreciated the wide areas of research activities going on at NIOH-ICMR.
- E) I have under "**Comprehensive Laboratory Safety Training**" conducted by Michigan Institute of Occupational Safety & Health at the University of Michigan, USA in April 2012. The course was useful in understanding the basic laboratory safety protocols in any chemical/biological laboratory. The same protocols will be implemented in our laboratory.
- F) I also learnt the basic spreadsheet (MS Excel) techniques for data analysis during April-May 2012.
- G) With the guidance and help of Prof. Dr. Stuart Batterman, I designed two new research projects namely i) *Risk Assessment of Polychlorobiphenyls (PCBs) among power transmission and distribution workers; and ii) Assessment of Diesel Exhaust Particulates & Polycyclic Aromatic Hydrocarbons (PAHs) in high-traffic zones of Ahmedabad, India;* for future research in India.
- H) As per Professor advice I audited/attended four post-graduate classes namely i) Environmental management of hazardous chemicals-Prof.Dr.Stuart Batterman; ii) Environmental health in developing countries-Prof.Dr.Jerome Nriagu; iii) Control of exposures to air borne pollutants-Lectuer-Kwangseog (Kwan) and iv) Advanced Exposure Assessment-Prof.John Meker; during the January to April 2012 period.
- I) From the class of "Environmental management of hazardous chemicals" taught by my professor Dr.Stuart Batterman-I studied i) "Risk management programs for off-site consequence and hazard analysis, e.g., RMP*COMP; ii) Emergency response programs for chemical incidents, e.g., ALOHA; iii) Integrated multimedia exposure analysis models for both genetic and specialized circumstances, e.g., CALTO, USES2, and IEUBK; iv) Indoor air quality models for air, soil and water; v) Single media models for air, soil and water; vi) Risk Assessment, life cycle assessment, health impact assessment; vii) Environmental indicator, e.g., footprint analysis. All these subjects are very much helpful to my day-to-day research work as well as for the institute in giving advice for various chemical incidents/disasters and major environmental issues arising from time to time.
- J) From the class of "Environmental health in developing countries" taught by Prof.Dr.Jerome Nriagu, I studied- I) Solid fuel use, indoor air pollution & health impacts; ii) Arsenic contamination of ground water in south east asia; iii) Environmental impact of dams and benefits; iv) Agriculture, pesticide use and environmental impacts; v) Urban development, environmental and health impact; vi) Environmental impact of transportation in developing countries; vii) Environmental impact of tourism industry; viii) Children's environmental health;

and ix) Natural and man-made disasters and emergency preparedness in developing countries, vulnerability of communities in developing countries

- K) From the class of "Advanced Exposure Assessment" taught by Prof. John Meker, I studied-I) classical, contemporary, and cutting-edge approaches to the estimation of human exposure to environmental and occupational agents as it relates to epidemiology studies as well as risk science, regulatory compliance, exposure source/route apportionment, and susceptibility factors. Qualitative and quantitative methods in exposure science will be covered, including surrogate measures, exposure modeling, and biological markers of exposure, in addition to statistical concepts like exposure measurement error and efficient study design.
- L) I also compiled literature on emerging environmental pollutants, including PBDEs, PCBs, PFCs and organochlorine compounds relevant to newborn blood spots, analytical methods, and their levels, information will be helpful in designing similar studies at this institute provided necessary infrastructure available.

II) Research Project Results, including any papers, prepared/submitted for publication:-

The research project results are explained in the research project report that is enclosed with this report. A manuscript would be prepared with the professor and will be sent to suitable journal for publication in due course of time.

III) Proposed Utilization of the experience in India:-

- A) The "Standard Operating Protocols-Sample Processing and analysis of PAHs in environmental and biological samples" were fully understood and would be applied for regular research work at the air pollution division of this institute.
- B) The research experience acquired during this fellowship helped me in designing two new research project namely i) Risk Assessment of Polychlorobiphenyls (PCBs) among power transmission and distribution workers; and ii) Assessment of Diesel Exhaust Particulates & Polycyclic Aromatic Hydrocarbons (PAHs) in high-traffic zones of Ahmedabad, India; for future research in India. These two research projects would be submitted to appropriate funding agencies.
- C) The standard operating protocols learnt during this fellowship for "Sample processing and analysis of Poly Brominated Diethyl Ethers (PBDEs) and Polychlorobiphenyls (PCBs) in biological samples" would definitely helpful in the execution of two newly designed research projects stated above.

Place: Ahmedabad
Date: 07-07-2012

Signature of ICMR-IF
Dr.S.Raghavan, Scientist-B (Chemistry)
National Institute of Occupational Health
(ICMR), Meghaninagar, Ahmedabad-380016

ICMR Sanction No. INDO/FRC/452 (Y-18)/2011-IHD DATED 19-12-2011



STUART A. BATTERMAN, MS, PHD
PROFESSOR OF ENVIRONMENTAL HEALTH SCIENCES
PROFESSOR OF CIVIL & ENVIRONMENTAL ENGINEERING

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Date: June 28, 2012

To: Dr. S. Raghavan, M.Sc Ph.D (Chemistry)
Scientist-B (Chemistry)
National Institute of Occupational Health
Indian Council of Medical Research
(Dept. of Health Research, Min. of Health & FW, Govt. of India)
Meghaninagar, Ahmedabad-380016, Gujarat, India
Office Ph:- 079-226888744; Mob:- 09428352388

Re: Report of host institute for ICMR International Fellow

1. Name of professor under whom training/research project carried out:

Prof. Dr. Stuart Batterman
Professor of Environmental Health Sciences and Civil and Environmental Engineering
Center Director, University of Michigan Center for Occupational Health & Safety Engineering

2. Name and address of host institute

Dept. of Environmental Health Sciences,
School of Public Health,
University of Michigan, 1420 Washington Heights, SPH-II
Ann Arbor, Michigan 48109-2029, USA.

3. Duration of Fellowship

01-01-2012 to 30-06-2012

4. Brief highlights of the achievements

Dr. Raghavan carried out the pre-designed pilot research project titled "Characterization of Diesel exhaust particulates & associated polycyclic aromatic hydrocarbons (PAHs) in high traffic zones of Detroit" under my guidance and the report is enclosed here with.

He learned the "Standard Operation Protocols for Extraction and Analysis of Polycyclic Aromatic Hydrocabons in Environmental and Biological Samples".

He helped to extract and . by GC-MS PAHs in diesel exhaust particulates, along with standard air sampling, processing and analysis techniques. He was also involved in sample processing and analysis of PAHs/PCBs/PBDEs in biological samples, e.g., blood and fish.

Per my advice he reviewed basic spread sheet techniques for data analysis

Per my advice he audited four post-graduate classes namely i) Environmental management of hazardous chemicals; ii) Environmental health in developing countries; iii) Control of

exposures to air borne pollutants and iv) Risk assessment of environmental pollutants, all during the January to April 2012 period.

Under my guidance he designed two research project namely i) Risk Assessment of Polychlorobiphenyls (PCBs) among power transmission and distribution workers; and ii) Assessment of Diesel Exhaust Particulates & Polycyclic Aromatic Hydrocarbons (PAHs) in high-traffic zones of Ahmedabad, India; for future research in India.

Finally, he compiled literature on emerging environmental pollutants, including PBDEs, PCBs, PFCs and organochlorine compounds relevant to newborn blood spots, analytical methods, and their levels, information helpful in designing similar studies.

5. Assessment of the ICMR-IF

The ICMR-IF program can provide an outstanding means to bolster skills and promote international collaborations. Careful matching of candidates and host institutions is needed. For Dr. Raghavan, the timing was optimal for taking courses and developing skills, however, the time commitment to the courses somewhat affected his ability in the research domain. Still, I believe that the program was valuable, his research efforts were fruitful and well considered, and potentially and hopefully this will lead to further collaborations.

6. Any other comments

I was happy to participate in the program and look forward to the next opportunity.

Please don't hesitate if further information is needed.

Sincerely yours,

A handwritten signature in cursive script that reads "Stuart A. Batterman".

Stuart A Batterman, Ph.D.
Professor of Environmental Health
Professor of Civil & Environmental Engineering

TOUR REPORT OF US VISIT DURING 01-01-2012 TO 30-06-2012

With reference to **ICMR New Delhi Office Order No.INDO/FRC/452 (y-18)/2011-IHD Dated 19-12-2011**, I visited Dept. of Environmental Health Sciences, University of Michigan-City of Ann Arbor, Michigan, USA during 01-01-2012 to 30-06-2012 as ICMR International Fellow 2011-12. I involved in various research activities described below.

I successfully executed the pre-designed research project titled "*Characterization of Diesel Exhaust Particulates and its associated Polycyclic Aromatic Hydrocarbons in the high traffic zone of Detroit City*" under the guidance of Prof. Dr. Stuart Batterman, Professor of Environmental Health Sciences & Civil Engineering, Head of Center for Occupational Health & Safety Engineering, Dept. of Environmental Health Sciences, School of Public Health, University of Michigan, USA during 01-01-2012 to 30-06-2012 at the Dept. of Environmental Health Sciences, School of Public Health, University of Michigan, Ann Arbor City, Michigan, USA. The project report is enclosed here with.

I also involved in the regular research work regarding analysis of PAHs in PM_{2.5} Particulates in Detroit city, Analysis of PCBs/PAHs/PBDEs in human blood and fish samples collected from Great Lakes of Michigan at the Dept. of Environmental Health Sciences, University of Michigan, USA during this visit. This helped me in understanding the sample processing, analysis of emerging environmental pollutants and quality control measures followed at University of Michigan, USA.

As per Professor's advice, I learnt spreadsheet techniques and standard operating protocols of air sampling and analysis of Diesel Exhaust Particulates for PAHs.

As per Professor's advice, I audited four Master's degree classes namely a) Environmental management of hazardous chemicals; b) Environmental health issues in developing countries, c) Control of exposures to chemical pollutants & d) Risk assessment techniques of toxic chemicals during January to April 2012 period. The study materials of this course will be helpful in regular research activities of our institute as well as it will be helpful for answering various scientific queries from various ministries/departments from time to time.

I have designed two new research projects namely a) Risk Assessment of PCBs among power transmission and distribution workers and b) Assessment of Diesel Exhaust Particulates and PAHs in High-Traffic Zones of Ahmedabad city under the guidance of Prof. Stuart Batterman for future research at this institute with the guidance of Prof. Stuart Batterman, Univ of Michigan, USA.

The overall research experience gained by me during this visit would definitely help to improve quality of research activities at air pollution division of this institute. This visit helped me in developing advanced analytical skills for environmental research and in designing two new research projects for this institute.

I am very much grateful to Director General of ICMR-New Delhi for sanction of "ICMR International Fellowship for Young Bio-Medical Scientist 2011-12" to me. I am also thankful to all the officers and staff of International health division of ICMR New Delhi for their help during fellowship period. I am thankful to the Director of NIOH-Ahmedabad for the official support extended to me during this visit.

Place: Ahmedabad
Date: 02-07-2012

Dr.S.Raghavan, Sc-B