

**CREN TRAINING WORKSHOP ON MONITORING AND ANALYSIS OF TOXIC
CHEMICALS AND BIOLOGICAL TOXINS IN FOOD AND WATER, INDUSTRIAL
TOXICOLOGY RESEARCH CENTRE (ITRC), LUCKNOW (INDIA),
MAY 15-20, 2000**

PARTICIPATING COUNTRIES : 8 (7 FROM THE MEMBER COUNTRIES OF THE CENTRE)

NUMBER OF PARTICIPANTS : 14

Pollution and contamination of food and water have been increasing due to industrialization and use of chemicals in industrial processes in agriculture, many of which have been found to be injurious to health leading to severe problems including respiratory, nervous and gastrointestinal. The Commonwealth Science Council (CSC) is implementing a project 'Chemical Research & Environmental Needs (CREN)' having four components, namely, Atmospheric Acidification, Chemical Contaminants / Pollutants, Gaseous Emissions & Analytical Techniques, and Quality Assurance. At the invitation of CSC, the NAM S&T Centre joined CSC to enable non-commonwealth members to participate in the project and in pursuance of the decision taken at the earlier review meeting of CREN held in New Delhi, it organized a training workshop on Monitoring and Analysis of Toxic Chemicals and Biological Toxins in Food and Water at the Industrial Toxicology Research Centre (ITRC) at Lucknow (India) during May 15-20, 2000. The Committee for Science and technology in Developing Countries (COSTED) also sponsored this event.

The aim of the training workshop was to identify technologies for removal and disposal of toxic chemicals and waste material toxins to assist in risk assessment, management of hazardous chemicals and wastes, and to discuss arsenic problem in groundwater and its solution. Apart from participants from Commonwealth countries, those sponsored by the NAM S&T Centre from non-commonwealth member countries were Egypt (Prof. Dr. Mohamed Ismail Badawy of the National Research Centre in Cairo), India (Dr. A. Sivasamy of the Central Leather Research Institute, Chennai, Mr. D.K. Dubey of the Defence Research and Development Establishment in Gwalior and Mr. Devendra Kumar of the Defence Research & Development Organisation in Jodhpur), Indonesia (Mr. Teguh Prayudi of Cleaner Production Group in the Agency for Assessment and Application of Technology BPPT in Jakarta) and Nepal (Ms. Jaishree Sijapati of the Royal Nepal Academy of Science and Technology in Kathmandu). In respect of Iraq, the National Committee for Technology Transfer nominated Dr. H.N. Al-Rawi and Dr. K.A. Rasheed, who could not make it to attend the workshop. Among the members supported by CSC were Bangladesh (Dr. Ms. Mamtaz Dawiatana and Mrs. Syeda Shahida Begum of the Bangladesh Council

of Scientific & Industrial Research), Botswana (Dr. J.F. Stagling and Ms. Dineo M. Rakaisa of the Botswana Technology Centre in Gaborone), Malaysia (Dr. Mrs. Chen Sau Soon of the Environmental and Energy Technology Centre in Shah Alam) and Sri Lanka (Dr. H.M. Kodisinghe of the Ministry of Forest and Environment in Borella, Mr. Segu M. M. Zaneer of the Industrial Technology Institute in Colombo and Dr. K. A. S. Pathiratne of the University of Kelaniya).

The Training workshop was inaugurated on 15th May. Dr. J.A.J. Perera of Commonwealth Science Council (CSC) gave a brief account of the genesis of the workshop and CREN activities for training workshops, country status reports, networking environmental monitoring and modelling to fulfill the commitments and satisfy the needs of less developed countries, utilizing the skills and capabilities of advanced networked institutions. Dr. P.K. Seth, Director ITRC referred to the diseases like Itai Itai owing to cadmium and Minimata on account of mercury poisoning and the challenges of arsenic poisoning affecting thousands of people in Bangladesh and West Bengal in India. He emphasized the need of addressing environmental problems jointly by scientists and environmental agencies. Dr. D.W. Connell of Griffith University, Brisbane, Australia delivered the keynote address entitled 'Chemicals in the Environment - Friends or Foe'. He pointed out that synthetic chemicals are essential for our society to maintain health and well being of the people. However, some of these have been found to have detrimental effects on human health and natural environment. He cited the example of Haber process by which atmospheric nitrogen can be converted to ammonia. Ammonia can be used in the manufacture of fertilizers, nitric acid, etc. The use of fertilizers has dramatically improved the yield of food and other crops. However, it has also led to nutrient enrichment of water bodies and eutrophication. The process has been accelerated and intensified by human actions. Excessive eutrophication has undesirable effects. Higher DDT concentration and related compounds in biota and low concentration in water is due to its high solubility in biota lipid. Dr. Connell stressed on the mechanisms to predict the adverse effects of contaminants to caution against the occurrence of an epidemic and said that global studies have identified long-range transport of POPs, which include pesticides, chlorohydrocarbons and polycyclic aromatic hydrocarbons, through the atmosphere, primarily in the northern hemisphere. The factors for global concentrations and distribution of POPs in soil and water are related to temperature effect from lower to higher latitude (e.g. equatorial to polar regions) and the ocean currents. Wind movements and particulate materials present in the atmosphere also affect the POPS concentrations significantly.

The training workshop comprised the keynote address, 15 lectures, 7 practical demonstrations and field visits and focused on various aspects of monitoring of bio-toxins and chemical toxicants in food and water through lectures and practical demonstrations. Dr. K. P. Singh, Scientist, ITRC, spoke on

the status of POPs in India. He stated that among POPs, aldrin, chlordane, endrin, heptachlor, toxaphene and benzenehexachloride are completely banned, whereas DDT and dieldrin are under restricted use in India. He emphasized that the organo-chlorine pesticides, which are very persistent in environment need much more attention for their control, and alternative safer molecules from natural sources are the need of the day. In his presentation on surveillance and analysis of aflatoxins in food, Dr. P.O. Dwivedi said that the contamination of food with aflatoxins occurs mainly during the growth of plant. Aflatoxins are the important metabolites produced by *Aspergillus* group of fungi and have carcinogenic, mutagenic and teratogenic potential. Poor, inadequate harvesting and improper storage practices are the major reasons of contamination. Giving the details of aflatoxin limits in food commodities in different countries, Dr. Dwivedi informed that maize, groundnut and paddy are the major crops in India, which are contaminated maximally. Since a large population consumes these crops, contamination of aflatoxins may pose higher hazard potential to human health. Meat and animal products, such as milk, may contain a good amount of aflatoxins. He suggested that preventive steps like proper agronomic practices, use of fungicides, crop rotation, use of resistant variety, proper drying of crop and its storage are very fruitful and should be followed. Prof. Badawy of the National Research Centre of Egypt spoke on the use and impact of pesticides in Egypt. He mentioned about the extensive use of pesticides in his country, of which fungicides account for 65.5%. Among the crops requiring fungicide treatment are potatoes, tree fruits and berries. In the last few years, the pesticides consumption has been significantly reduced, largely due to the Integrated Pest Management (IPM) Programme. He also mentioned about the major constraints faced in the implementation of IPM, which include poor education of farmers, improper standardized system for collecting and recording of the available data, non-availability of sophisticated application equipment and farmers' dependence on pesticides, etc. Dr. P. V. Lakshmana Rao from Defence Research & Development Establishment, Gwalior, India delivered a lecture on isolation, culture and toxicity of cyanobacteria. He stated that toxic blue green algae, cyanobacteria, produce lethal water soluble toxins which are temperature stable. Since they occur in both recreational and drinking water lakes and rivers and are known strong liver tumor promoters, they can be a potential health hazard to the human population. He suggested that the estimates of the hazards posed by cyanobacterial toxins to human health should be kept under constant review. Highlighting the presence of heavy metals in water bodies including rivers, streams, lagoons, estuaries, reservoirs, coastal reefs and canals of Sri Lanka, Dr. K.A.S. Pathratne of the University of Kelaniya, Sri Lanka, expressed the necessity of a pollution monitoring programme for all important water bodies in the developing countries. It should involve appropriate experimental design, systematic sampling, accurate analysis, relevant treatment of data, meaningful interpretation of results and sharing of information. Ms. Mamta Dawlatana of the

Bangladesh Council of Scientific & Industrial Research elaborated on a high incidence and high levels of aflatoxins (fungal toxins) exposure in Bangladesn population consuming groundnut and maize. Referring to the work carried out in temperate climatic environment, Dr. S.S. Chen of Environmental and Energy Technology Centre, Malaysia, emphasized the need for systematic studies in tropical environment also, where ambient temperature and microflora differ from temperate countries. This would lead to development of a set of eco-toxicological evaluation procedures unique to the tropical climatic conditions.

Later, the participants presented their country reports giving the status of the work done in this area. The participants received hands on training on isolation, estimation and characterization of biological toxins including mouse bioassay. They also learnt the use of TLC/HPLC, RIA and ELISA for estimation of afla-toxin and other bio-toxins. Application of Microtox technique for rapid bioassay of organic and inorganic contaminants in water was also demonstrated. The participants were trained in the use of modern techniques including GC-MS, HPLC-MS, GLC and enzyme-linked immunosorbentassay (ELISA) for analysis of pesticides residues in water. Analysis of metals using MS, ICP and ion electrode with specific emphasis on arsenic and fluoride and their impact on health were also discussed and demonstrated. In addition, participants were also apprised regarding the selection of disposal sites, environmental impact assessment and landfill design for the management and safe disposal of wastes.

The training workshop proved to be quite fruitful as it provided hands on exposure to analysis of toxic chemicals and bio-toxins at very low levels. This enabled the participants to adopt and use these techniques for monitoring of chemicals and toxins in their countries. During the discussion, a need for holding such training programmes from time to time was strongly felt. Development of collaborative programmes for monitoring the pollutants and sharing the knowledge base available for preventing and controlling the eco-toxicological and environmental health problems in the member countries was recommended. Some participants requested ITRC scientists to help in developing postgraduate curricula in the area of Toxicity for their countries Similarly, participants from some countries expressed desire to share the knowledge and expertise and to develop a joint collaborative programmes in the area of hazardous solid waste management with ITRC.