

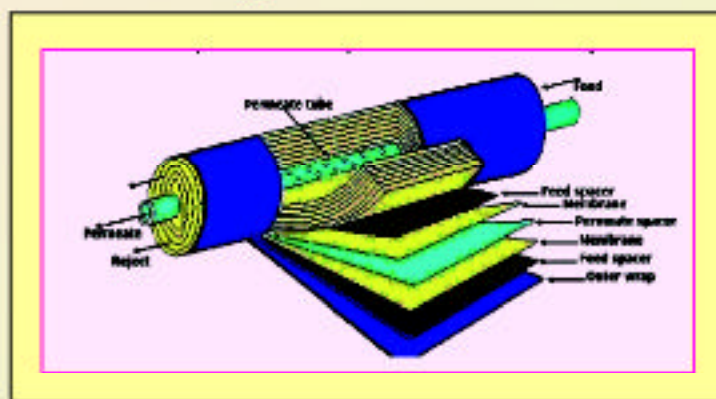


Team
CSIR

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NCL develops ultrafiltration membrane-based water purifier

WATER-borne diseases such as cholera, typhoid, polio, dysentery and hepatitis are caused by pathogenic bacteria and viruses and spread through contaminated water, particularly where proper sanitation facilities are not available. Common water disinfection methods, such as chlorination, ultraviolet (UV), and ozone filtration/treatment kill pathogenic species, leaving cell debris. Use of membrane in water treatment has the advantage of physically removing undesirable species in water like worms, spores, bacteria and viruses. Scientists at the National Chemical Laboratory (NCL), Pune, have developed an ultrafiltration (UF) membrane with pores too small to permit viruses and bacteria. Special additive used in the dope solution for membrane casting controls membrane porosity and offers membranes with desirable pore size. It operates on normal tap water pressure (0.5 bar) and does not



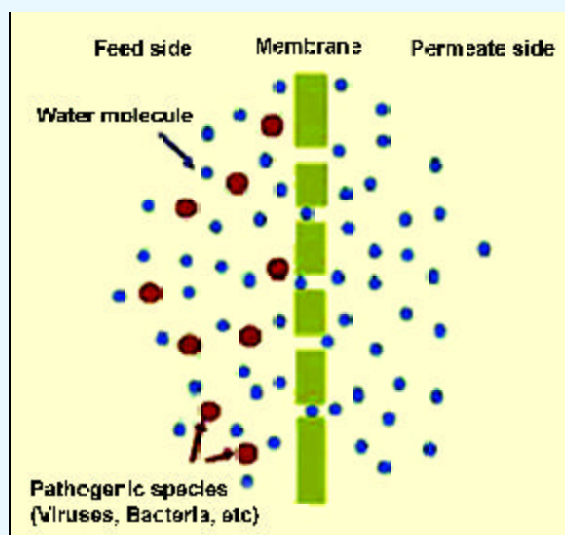
require electricity. The device uses a flat sheet UF membrane that withstands pressure up to 4 bars. It is wound in the form of a spiral module and fixed in PVC housing. The membrane module for household application is 30 cm long with 6.5 cm diameter; while a longer one (1 m long with the same diameter) is suitable for community applications. The water filtration rate for 30 cm module is 1 lit/min, and 3 lit/min at 1 bar pressure for community module. Average life of the membrane is three years depending upon the quality of water.

R&D Highlights

The performance test by the Pune based Agharkar Research Institute and National Institute of Virology has shown a 5-log reduction for viruses (including Hepatitis-A virus) and 7-log reduction for bacteria (including *Escherichia coli*, *Salmonella typhi* and *Vibrio cholera*). The modules filter solutes of molecular weight more than 60,000 dalton. However, it does not remove dissolved salts of small particle size.

Field trials of the device have demonstrated its use in rural environment, particularly cyclone affected areas in Orissa and earth-quake affected areas in Gujarat. The units installed at Orissa cyclone site proved effective in microbial count as tested by National Environmental Engineering Research Institute (NEERI), Nagpur. Applicability of the membrane was demonstrated in various prototype units like hand

pump, foot pump, cycle pump, and compact, online and electrically operated pumps. With the support of Department of Science and Technology (DST), New Delhi, 40 units have been supplied to NGOs working in public health monitoring for trial and performance evaluation. The technology on non-exclusive basis has been transferred to M/s. Membrane Filters (India) Pvt. Ltd.



NIO signs MoU with BSIP

THE National Institute of Oceanography (NIO), Goa, entered into partnership with Birbal Sahni Institute of Palaeobotany (BSIP), Lucknow, signing a Memorandum of Understanding. Dr Satish R. Shetye, Director, NIO, on behalf of Council of Scientific & Industrial Research and Dr N. C. Mehrotra, Director, BSIP, were the signatories of the MoU.

According to MoU a 5-year accord will complement the capabilities in the areas of basic and applied research, teaching and training of both the organizations. NIO is carrying out research, consultancy, logistics and training in all the disciplines of oceanography and allied fields at headquarters and its regional centers at Mumbai, Kochi and Visakhapatnam. Similarly, the BSIP is involved in research, consultancy, training and education in palaeobotany (including palynology), allied fields and geochronology.

Dr Rajiv Nigam, Scientist, NIO and Dr Rahul Garg, BSIP, will coordinate the activities in the identified areas of micropalaeontology, palynology, geochronology, placers, archaeology and palaeoclimatic studies.



Dr Satish R. Shetye, Director, NIO and Dr N. C. Mehrotra, Director, BSIP, exchanging the documents of MoU after signing

Genetic Association, Post-translational Modification and Protein-Protein Interactions in Type 2 Diabetes Mellitus

AMITABH Sharma, Sreenivas Chavali, Anubha Mahajan, Rubina Tabassum, Vijaya Banerjee and Dwaipayan Bharadwaj, Scientists at Institute of Genomics and Integrative Biology (IGIB), Delhi and Nikhil Tandon from All India Institute of Medical Sciences (AIIMS), New Delhi, demonstrated the genetic association, post-translational modification and protein-protein interactions in *Type 2 Diabetes Mellitus*. This work is being published in a journal from The *American Society for Biochemistry Molecular Biology, Inc.*

Type 2 Diabetes Mellitus is a complex disorder with a strong genetic component. Inherited complex disease susceptibility in humans is most commonly associated with single nucleotide polymorphisms. The mechanisms by which this occurs are still poorly understood. Here, the focus was on analyzing the effect of a set of disease causing missense variations of monogenetic form of *Type 2 Diabetes Mellitus* and a set of disease associated non-synonymous variations in comparison with that of non-synonymous variations without any experimental evidence for association with any disease. Analysis of different properties such as evolutionary conservation status, solvent accessibility, secondary structure, etc. suggests that disease causing variations are associated with extreme changes in the value of the parameters relating to evolutionary conservation and/or

protein stability. Disease associated variations are rather moderately conserved and have milder effect on protein function and stability. Majority of the genes harbouring these variations are clustered in or near insulin signaling network. Most of these variations are identified as potential sites for post-translational modifications; certain predictions have already reported experimental evidences. Overall, results indicate that *Type 2 Diabetes Mellitus* may result from a large number of SNPs which impair modular domain function and post-translational modifications involved in signaling. The emphasis is more on conserved corresponding residues than the variation alone. It is believed that the approach of considering a stretch of peptide sequence involving a polymorphism would aid as a better method of defining its role in the manifestation of this disease. Since most of the variations associated with the disease are rare, it is hypothesized that this disease is a 'Mosaic model' of interaction between a large number of rare alleles and a small number of common alleles along with the environment, which is little contrary to the existing Common Disease Common Variants model.

Type 2 Diabetes Mellitus (T2DM) is a genetically heterogeneous, polygenic disease with complex inheritance pattern and is caused by genetic predisposition and environmental factors. The precise biochemical defects are unknown

and almost certainly include impairments in insulin secretion and insulin action. T2DM is characterized by abnormal glucose homeostasis leading to hyperglycemia and is represented primarily by insulin resistance. The vast majority of insulin resistance in T2DM has been shown to arise due to defects at the post-receptor level. T2DM is also heterogeneous in the associated pathological and physiological symptoms leading to a variety of complications such as coronary heart disease, neuropathy, retinopathy, etc. Genetic dissection of any complex trait is done based on two approaches, which include genome wide scan studies and association studies. The concept of association studies is being widely applied as an experimental technique to identify Single Nucleotide Polymorphisms (SNPs) underlying complex phenotype, which represents the most common form (90%) of genetic variations in humans. Association is defined as a statistical statement about the co-occurrence of alleles or phenotypes. Owing to the application of high-throughput SNP detection techniques, the number of identified SNPs is growing rapidly enabling detailed statistical studies. Over the past decade many laboratories have sought to clarify the etiology of T2DM by attempting to associate clear differences in metabolic phenotype with mutations or polymorphisms in the genes. As a result of this a large

amount of data has accumulated, associating SNPs in a large number of candidate genes with the disease across different populations. Unlike fully penetrant mutations that cause Mendelian diseases, SNPs involved in complex human phenotypes are not a necessary and sufficient condition defining the phenotype but their effect depends on many other genetic and environmental components. In other words SNPs are shown to comprise risk factors of having a specific phenotype more in a statistical sense. This raises the question as to whether the associated SNPs are only of statistical significance. If not then, what might be the reason for encountering differences in variation statistics across different populations as shown by Cargill et al. However, identifying SNPs responsible for specific phenotypes appears to be an enigma that is very difficult to solve.

Several recent studies have applied computational methods to predict the potential effects of the non-synonymous coding SNPs in bringing about variations in humans. A focus on the individual factors that highlight their maximum potential effect (whether positive or deleterious) is often optimistic, as in practice they do not operate in isolation. Instead they work jointly to generate the disease gene architecture and hence a study to determine the contribution of these interactions towards the disease is essential. Ideally, the end point of disease gene identification should be functional analysis of the disease associated allele and an understanding of the molecular

mechanism of causation of the disease phenotype. The functional characterization can be facilitated by the computational analysis. Vitkup et al. have shown that the probability of a non-synonymous mutation causing a genetic disease increases monotonically with an increase in the degree of evolutionary conservation of the mutation site and a decrease in the solvent accessibility of the site; opposite trends are observed for non-disease polymorphisms. In the current study the effect of non-synonymous variations on the structure and function of proteins has been extensively analyzed and attempted to determine their possible role in the disease phenotype.

Type 2 *Diabetes Mellitus* is a multifactorial disorder involving a plethora of contributing factors, with a strong genetic component as proved from twin studies. The widely practiced method to genetically dissect this disorder has been to perform association studies at a population level. Often association of alleles is dealt at the DNA level and the results obtained are interpreted with a statistical sense. Here, a systematic evaluation of determining the role of these variations in affecting protein structure and function is reported, as knowledge of these provide a more rational approach to fight against the disease. A simple random model, in which variations at any position on the set of the proteins found not to be associated to disease was used as a control data set to evaluate and distinguish the observations on the DCVs and

DAVs from that occurring purely by chance.

The presence of most of the DCVs in the domains and their high Scorecons values and PSIC scores indicate that these lie at highly conserved sites, which have high selection pressure. The occurrence of most of these variations at the buried sites proves that the changes affect the protein stability and are deleterious. Thus it is comprehensible that these would be damaging (as predicted by Polyphen) and individually have the Research ability to cause the disease. Majority of the DAVs lie in the functional signatures and in pattern analysis it is evident that most of them exist in consensus post-translational modification patterns. The relative entropy data from Scorecons clearly indicate that the DAVs lie in moderately variable positions but it is interesting to note that the corresponding amino acids near the variants have low relative entropies meaning high conservation. Some of the well-characterized protein interaction domains involved in insulin signaling include the PH, PTB, SH2, SH3, LIM, PDZ, NOTCH, and WW. These interaction domains are either created by post-translational covalent modification of the protein, which includes phosphorylation of exposed Tyr, Ser or Thr residues, or they exist in the natural tertiary structure of proteins that is highly influenced by the core residues. Pattern search defines that as many as 51% of DAVs appear to occur in potential post-translational modification sites. Certain phosphorylation changes

predicted as an effect of these variations also have experimental evidences. The emphasis is more on conserved neighbouring residues than the variation alone because the specificity of protein-kinases is dominated by acidic, basic or hydrophobic residues adjacent to the phosphorylated residue. It has also been shown that the major class of proteins harboring DAVs is enzymes, the most common susceptible amino acid change is arginine and most of the 15 DAVs are exposed. Pathway assist networking converges all the genes towards insulin signaling cascade. It is well known that in any signaling cascade the cross talk between proteins to bring about transduction is done mainly through post-translational modification mechanisms. All these facts propose that T2DM must be a result of disturbed protein-protein interactions. Low PSIC scores and prediction of most of the DAVs as benign by Polyphen indicate that the contribution of DAVs is more in terms of quantitative nature than qualitative in bringing about the

disease. It is believed that the approach of considering a stretch of peptide sequence involving polymorphisms would aid as a better method of defining the role of a polymorphism in the manifestation of this disease. This is relevant when considering the possibility of using these properties to predict the pathological character of a mutation from only the knowledge of protein sequence. This study suggests that there is a significant statistical difference in distribution of properties between disease related variations and CNVs. It is provocative to say that the evaluation of these parameters can help in predicting whether newly discovered non-synonymous variations would be associated with the disease or not. Initial association studies led to the proposition that T2DM is an example of Common Disease Common Variant hypothesis (well in accordance with Thrifty genotype hypothesis). Observations reveal that more than 80% of the DAVs associated with T2DM are rare variants. Of the overall 113 polymorphisms

considered in the data set, 70% of SNPs associated with the disease qualify, as rare variants while the rest are common variants. On this basis, it is proposed that T2DM fits a mosaic model, which results from complex interaction between low number of rare alleles from a large number of loci with a low number of common alleles at small number of loci and the environment. This also implies that the disease phenotype has evolved recently. One of the main reasons for the failure to replicate these associations across different populations must be variable expressivity resulting from selection pressure that has occurred in accordance with the temporal differences in the life style adoption. These findings may complicate the understanding of already complicated complex disorder T2DM gene hunting because occurrence of many rare variants would create statistical disturbances. But these findings would help the researchers to look from new perspectives in a highly competitive field. □

IICT's Societal Mission for Defluoridation of Ground Water in Nalgonda District

THE Indian Institute of Chemical Technology (IICT), Hyderabad, has designed and installed a Reverse Osmosis (RO) pilot plant for generation of drinking water from a ground water source containing 5 ppm of fluoride in Myalaram village, Bommalaramaram Mandal of Nalgonda District. The

pilot plant costing approximately Rs 3.5 lakhs produces 600 litres/hr of fluoride-free drinking water at an operating pressure of 8kg/cm². The water containing < 0.5 ppm of fluoride and about 20 ppm of total dissolved solids (TDS) which constitute essential nutrients required by humans, is produced

from the raw water containing 1200 ppm of TDS. The rejection of total dissolved solids is ~ 98% and fluoride 92%. The flux is generally maintained at 25 litres/hr/m² and quantity of water recovered for drinking is about 65%. The remaining 35% water is the reject for disposal which is proposed to be

R&D Facilities

used for washing of clothes or gardening applications in the future. The operating cost including membrane replacement, power cost and system maintenance comes to 4-5 paise per litre. The plant is expected to provide safe drinking water for a village population of approximately 1035 people in 207 hamlets. Current 'Nalgonda Technique' used at present, to remove the fluoride by adsorption suffers from disadvantages such as poor fluoride removal capacity, inability in separation of other impurities (sulfates, microorganisms etc.), low flow rates and high operating costs.

IICT trained some of the village personnel in routine operation and maintenance of the pilot plant as well as cleaning and storage of the membrane by chemical methods. The process was initially demonstrated to the funding agency, Anesvad, Spain, through JK Perfect Project Designers, Hyderabad, and the plant was supplied by Permionics Membranes Pvt. Ltd, Vadodara. A local NGO called Rural Organization for Social Education (ROSE) has been of immense help in providing logistical support for the successful installation of the RO plant. The Director, IICT, recently inaugurated the plant.



A view of reverse osmosis pilot plant, designed and installed by IICT, in Nalgonda District

Databank for the CSIR's Network Project on Groundwater (COR0005)

THE National Geophysical Research Institute (NGRI), Hyderabad, has developed a databank for CSIR's network project entitled 'Development of Techniques and Methodologies for Exploration, Assessment and Management of Groundwater in Hard Rock Areas'.

Since the beginning of the project, an exclusive activity on data bank and data management was planned. Now an interanet webserver has been designed using servlets (Tomcat). The package is managed by MS-ACCESS. In

addition of the data bank this package is interactive, user friendly and also displays other relevant information. To use this facility one has to register and he/she will be authorized in three different categories.

For security reasons, only activity leaders will be able to access the data files. The accesses designed are Equipment available, Watershed studied, Data generated, Technical reports, Meetings and News.

The other facilities for example the 'Equipment available' will provide the list of the equipment

procured in the project and can be used effectively by any participating lab. This being Interanet webserver, presently scientists at NGRI can only access the facility but will soon be extended to all the participating CSIR labs by developing Internet webserver. This will make the project more interactive and will be network project in the real sense. Dr D.K. Paul, the Chairman of the CSIR Monitoring Committee of this project inaugurated the facility in the presence of Dr V.P. Dimri, Director, NGRI, who is also the Chairman of the task force. Dr Shakeel Ahmed, Scientist F, NGRI, led this activity.

Shri Kapil Sibal visits NEERI

HON'BLE Minister for Science & Technology & Ocean Development and Vice President, CSIR, Shri Kapil Sibal recently visited National Environmental Engineering Research Institute (NEERI), Nagpur. He visited the Permanent Exhibition of the Institute and also different laboratories of NEERI. Shri Sibal was shown demonstrations on various significant activities related to environmental genomics, environmental biotechnology, environmental materials and wastewater treatment. Later on, Shri Sibal addressed the NEERI staff.

While addressing the gathering, the Hon'ble Minister, said that there is an urgent need to save the earth from environmental degradation. He pointed out that due to inadequate environmental policies, the importance of the environment has often been minimized. This situation has given birth to environmental problems like global warming and melting of glaciers, he said. In this context, Shri Sibal appealed to NEERI scientists to tackle such environmental challenges. Hon'ble Minister advised to invent such technologies that are affordable and practicable in the Indian context. Shri Sibal further



Dr S. Devotta, Director, NEERI, showing the permanent exhibition to Shri Kapil Sibal, Hon'ble Minister for Science & Technology & Ocean Development and Vice President, CSIR. NEERI Scientists are also present

said that solutions for mitigation of adverse impacts to environment should be cheaper. He said that in future India can become a center for the world for providing solutions to environmental problems.

Quoting an example of antibiotics for pharmaceutical industry, Shri Sibal said that this medicine was derived from nature to destroy pathogenic microorganisms. Likewise, environmental scientists should utilize nature to combat environmental degradation, but not at the cost of exploitation of nature, he added. Shri Sibal cited the examples of environment friendly solar energy and generation of drinking water from the ocean. He informed that recently he inaugurated a water treatment plant that can convert ocean water into drinking water at Kavaratti, due to which more than 11,000 citizens of Kavaratti have now been provided drinking water.

On the occasion, Hon'ble Minister gave details of two fellowships for scientists. He said that scientists from any institute and discipline may apply for Ramanujam Fellowship in which they can earn Rs 50,000/- per month with an additional



Shri Kapil Sibal, Hon'ble Minister for Science & Technology & Ocean Development and Vice President, CSIR visiting the Environmental Genomics Unit of NEERI and being explained about its work by a NEERI Scientist

Visits/Workshops

incentive of Rs 5 lacs per annum. He also announced J. C. Bose Fellowship, in which scientists working in India can earn Rs 30,000/ per month with an additional stipend of Rs 5 lacs per year. Besides these, Shri Sibal informed that he would strive to introduce a legislation by December 2005 or early next year for providing public private partnership to scientists by which scientist would be given a major share of the royalty for their research work. Shri Sibal exhorted scientists to work for the benefit of common man and do research for saving the environment. He urged NEERI scientists to provide effective solutions and technologies for the common man. Shri Sibal also released a pictorial document 'Historical Glimpses', illustrating the history

of NEERI, on this occasion.

Earlier, Dr Sukumar Devotta, Director, NEERI, welcomed the Hon'ble Minister, Shri Kapil Sibal and made a presentation to the gathering highlighting the past, present and future R&D activities of NEERI. Dr Devotta assured the Hon'ble Minister that NEERI will continue to strive for excellence in R&D in environmental science & engineering for sustainable development. The programme concluded with a vote of thanks, proposed by Dr T. Chakrabarti, Director Grade Scientist, NEERI. The function was largely attended by the scientists of NEERI, local academicians and general public. □

Workshop on Current Techniques in Genetic Toxicology

THE Industrial Toxicology Research Centre (ITRC), Lucknow, recently organized a Workshop on 'Current Techniques in Genetic Toxicology.' The workshop was sponsored by CSIR, and co-sponsored by Environmental Mutagen Society of India.

During the fifteen-day workshop, eminent scientists from six countries (India, USA, Austria, Norway, The Netherlands and Slovakia) delivered lectures and gave hands-on training to sixteen participants drawn from the pharmaceutical industry, academic and R&D institutions. A total of 34 lectures and 14 practical demonstrations were held.

At the Inaugural Function, Prof. Y. K. Gupta, the then Director, ITRC & Chairman, Organizing Committee, outlined the genesis of the workshop. He said that the objective of the workshop was to create human resource in the area of genetic toxicology. Dr C. M.

Gupta, Director, Central Drug Research Institute (CDRI), Lucknow, in his Inaugural Address, said that regulatory agencies now require toxicology data pertaining to reproductive, teratogenic, and mutagenic effects of a chemical on a cell. These agencies emphasize that scientific experiment should utilize the least numbers of animals and should use alternative models for toxicity testing. Both CDRI and ITRC have taken up a CSIR Network project on 'Animal models and animal substitute technologies.' He hoped that predictive toxicology tools would be used in toxicology. Dr C. M. Gupta released the Abstract Book of the workshop.

Dr R. C. Simal, former Director, ITRC, in his Presidential Address said that new chemicals being introduced into the environment could cause toxicity and the need of the hour is to predict the toxicity of these chemicals before these are released. He said that earlier there

were no regulations on the use of animals in toxicity testing but now the regulatory agencies have imposed restrictions on *in vivo* studies. Dr Simal also released the Protocol Manual on the occasion. Dr Alok Dhawan, Organizing Secretary, proposed the Vote of Thanks.

The workshop began with the topic Comet Assay. Dr N.P. Singh, University of Washington, Seattle, USA, delivered the Keynote Address on the 'Assessment of DNA damage and apoptosis in human sperm and its significance to the health of future generation.' He spoke on how the DNA damage in sperm, contributed by age and environmental factors (smoking, diet and pollution), may lead to birth defects and genetic abnormalities in foetus as well as in the adult.

Prof. Andrew R. Collins, University of Oslo, Norway, spoke on the 'Oxidative DNA damage in human cells, its methods of

detection and biological significance.' He spoke about ESCODD — an organization of 25 member laboratories working on examining the problem of the background levels of oxidation of Guanine and devising methods for its detection with minimized adventitious oxidation to reach a consensus on the real level of oxidation.

Dr P.S. Chauhan, former Emeritus Scientist, Bhabha Atomic Research Centre, Mumbai, gave a talk on 'Genetic toxicology: past, present and future' in which he comprehensively overviewed this important discipline of toxicology and the beginning of chemical mutagenesis. He highlighted the emergence of toxicogenomics for resolving the complex and primary issues in toxicology and health risk assessment as well as the emerging new scenario and response in toxicology.

Dr Maria Dusinska, Slovak Medical University, Slovakia, dwelled on the 'Relevance of biomarkers of individual susceptibility in molecular epidemiology studies.' She spoke about how the monitoring of single nucleotide polymorphisms in different genes could help investigate the influence of environmental exposure, nutrition and genetic factors on genomic stability at the level of individuals.

Dr D. K. Agarwal, ITRC, delivered a talk on the 'Application of GLP principles in toxicology studies.' He apprised the participants about the principles and utility of GLP as desired for toxicity studies on items contained

in pharmaceutical products, cosmetics, food etc.

Shri Brijesh Regal, Apothecaries Ltd, WHO National Consultant, spoke about 'Harmonizing clinical research regulations in India.' Being a part of an expert group, involved in documenting and reviewing Indian clinical research regulations, he presented an in-depth preview of new regulations and guidelines concerning clinical research in India and their comparison with ICH-GCP guidelines and other global requirements for conducting clinical research.

Dr Mukul Das, Food Toxicology Division, ITRC, enumerated the genotoxic and carcinogenic potential of argemone oil (mustard oil adulterant) and its evaluation on mice using Comet assay and micronucleus as end-points.

Dr Alok Dhawan, Developmental Toxicology Division, ITRC, delivered a talk on 'Monitoring human genotoxicity using the Comet assay.' He discussed the various methods being used for monitoring human genotoxicity and elucidated the advantages of Comet assay over conventional techniques. He also gave a presentation on 'The multiple organ genotoxicity in mouse: A Comet assay perspective,' elucidating the use of Comet assay in evaluating genotoxicity in non-specific target organs, of a chemical, thus allowing for comparison of their responses under identical treatment conditions. Prof. A. T. Natarajan, Department of Toxicogenetics, Leiden University Medical Center, The Netherlands, gave a talk on 'Biomonitoring of human

populations exposed to genotoxic agents.' He discussed the various end points including DNA adducts, haemoglobin adducts, chromosome aberrations, sister chromatid exchanges and point mutations, using peripheral human blood lymphocytes and oral mucosal cells, as well as their relative merits. In another lecture, he illustrated the use and advantages of a molecular cytogenetic technique, fluorescent *in situ* hybridisation (FISH) in genetic toxicology.

Dr Sudhir Chandna, Institute of Nuclear Medicine & Allied Sciences, New Delhi, gave a talk on the 'Detection of programmed cell death and necrosis using neutral Comet assay.'

The session on Flow Cytometry began with Prof. U. C. Chaturvedi and Dr Rishi Shanker as the Chairpersons. The Opening talk delivered by Dr Madhu Dikshit, CDRI, was on 'Flow cytometry: A powerful technique to evaluate potential drug molecules and their toxicity'. She also delivered another lecture on the 'Flow cytometric evaluation of free radical generation from neutrophils: An exploration,' in which she elucidated the oxidative burst in polymorphonuclear leukocytes (PMNs) and focused on the advantages of flowcytometry in evaluating free radical generation over other existing methods.

Dr Ubaldo Barbosa, BD Biosciences, New Delhi, gave a talk on 'Flow cytometry: technology.'

Dr Yogeshwer Shukla, ITRC, gave an overview of the 'Application of flow cytometry in apoptosis, ploidy and cell cycle analysis. He emphasized the significant

Workshops

implications for such areas as clinical tumour prognosis as well as immunodiagnosics.

Dr Alok Dhawan, ITRC, spoke about 'Micronucleus assay using flow cytometry.' He informed that flow cytometry is a powerful tool for simple, rapid, automated and sensitive detection of micronucleus. Prof. Sita Naik, Sanjay Gandhi Post Graduate Institute of Medical Sciences, (SGPGIMS) India, in her talk 'Use of flow cytometry for functional assays' explained about this technique in the field of immunology research. Prof. Soniya Nityanand, SGPGIMS, showed how flow cytometry has been carried from laboratory to patients. Her lecture was entitled 'Flow cytometry: bench to the bedside.'

Dr Gopal Pande, Centre for Cellular and Molecular Biology, Hyderabad, spoke on 'Multi-parametric cell cycle analysis by flow cytometry.' He presented a new methodology developed for detecting differences in mitochondrial size and activity and it was used to examine the changes in mitochondrial size during the course of the cell cycle.

In another lecture, he spoke on the 'Mitotic chromosome analysis by flow cytometry' and explained the methodology involved, expertise required and potential applications in molecular genetics and other areas. Dr Rochak Badhwar, BD Biosciences, India, gave a talk on 'Cytokines estimation using the Cytometric bead array' using flow cytometer. He also gave a complete demonstration of the Cytometric bead assay in the practical session.

Dr Ashwani Kumar, ITRC, gave a comprehensive overview of the Microarray technique in his lecture 'Microarrays: principles and applications.' Dr Syed A. Hashsham, Michigan State University, USA, described some of the tools and techniques common to most microarray platforms, in his lecture 'Bioinformatics tools and techniques for various microarray platforms and applications'. The next session was on Fluorescent *In Situ* Hybridisation. Prof. Vikram Jayanth of Sri Ram Medical Centre and Research Institute, India, gave the opening lecture on 'Fluorescence *in situ* hybridization (FISH): application in diagnosis & research' and described in detail different types of FISH and their uses. Dr Shubha R. Phadke, SGPGIMS, gave a talk on 'Clinical cytogenetics & role of FISH.' Shri Nikhil Garg, ITRC, enlightened the audience about the types of search engines, facilities and special features available and useful tips for web searching in his talk 'Sink or swim: internet search tools & techniques.' Dr B.S. Dwarakanath, Institute of Nuclear Medicine and Allied Sciences, gave a talk on 'Analysis of cell death using multi-parameter flow cytometry'. Dr Ashutosh Halder, All India Institute of Medical Sciences, reviewed 'Molecular cytogenetic techniques in genetic toxicology study' giving details of techniques such as the Fluorescence *in situ* hybridization, Primed *in situ* labeling, quantitative fluorescence PCR, array CGH, etc., which may be used to study genetic toxicity in human both for research as well as clinical applications.

Prof. Siegfried Knasmuller, University of Vienna, Austria, spoke about 'Use of plant bioassays for the detection of environmental carcinogens and mutagens' and explained the various protocols developed for environmental *in situ* monitoring with plant bioassays. Dr A.B. Pant, ITRC, summarized the various assays used in toxicity testing in his comprehensive talk '*In Vitro* Cytotoxicity Assays in Toxicology.'

Prof. Georg Krupitza, Medical University of Vienna, Austria, presented an improved assay to measure cell proliferation and a novel assay to measure and determine the type of cell death in his talk 'Application of a double staining method detecting and quantifying early onset of apoptosis and discriminating between apoptosis and necrosis after exposure to cytotoxic agents,' which allowed routine assessment and validation of the bioactivity of compounds.

Dr Kailash C. Khulbe, ITRC, gave a talk on 'How to convert your idea in to a patent?' illustrating IPR issues related to toxicology with case studies in the area of genetic toxicology.

Demonstration and Practical Sessions:

The lectures were followed by demonstration of various techniques, which were subsequently performed by the participants.

Dr N. P. Singh, University of Washington, Seattle, USA demonstrated 'Detection of DNA strand breaks in human sperm using

Training Programmes

the Comet assay' as well as 'Comet assay in human sperm and in human lymphocytes.' Prof. Andrew R. Collins, University of Oslo, Norway and Dr Maria Dusinska, Institute of Preventive and Clinical Medicine, Slovakia demonstrated 'In vitro DNA repair assay in human lymphocytes' after treatment with hydrogen peroxide and using enzymes such as Endo III and formamidopyrimidine DNA glycosylases. Dr Sudhir Chandna, Institute of Nuclear Medicine & Allied Sciences, demonstrated the neutral Comet assay in human glioma cells. Dr Alok Dhawan, ITRC, gave a demonstration of micro Comet assay using CHO cell line adapted in a 96-well micro-titre

plate. He demonstrated the assessment of DNA damage in CHO cells after exposure to ethyl methanesulfonate using Comet assay. He also demonstrated the flow micronucleus assay, with details of protocol. Prof. Sita Naik, demonstrated cell surface staining in human lymphocytes using the CD3 and CD4 markers using flow cytometry. Dr Ubaldo Barbosa, apprised the participants about the basics of flow cytometry in the practical session. He explained the various parts of the machine and then proceeded to explain how to use the machine as well as the software and analysis. Dr Y. Shukla, ITRC, and Dr Ubaldo Barbosa conducted a wet lab demonstration

of apoptosis and necrosis using the flow cytometer. Prof. Vikram Jayanth demonstrated the protocol of Fluorescent *in situ* hybridisation in human lymphocytes using chromosome 1 antibody. Prof. Siegfried Knasmuller demonstrated the *Tradescantia* micronucleus assay in the meiotic pollen tetrad cells.

The workshop ended with a Valedictory Function in which Dr S.P.S Khanuja, Director, Central Institute of Medicinal and Aromatic Plants, Lucknow and Prof. P.K. Seth, Scientist-in-Director's Grade, ITRC, and CEO, Biotech Park, Lucknow, gave away the certificates to the participants. □

Awareness Programme on RRL Technologies for Micro Enterprises

AT the request of Shri Amrik Singh, President, Northeastern Small Scale Industries Association (NESSIA), an NGO of Jorhat city, which caters to the needs of entrepreneurs of the region, the Regional Research Laboratory (RRL) Jorhat, organized a two-day awareness programme under the theme 'Awareness programme of RRL technologies for micro-enterprises' for the benefit of local entrepreneurs. Shri R.K. Sachdev, former Advisor (Coal) to the Government of India and President of Coal Preparation Society of India formally inaugurated the programme. A total of 24 qualified entrepreneurs coming from different parts of the region participated in the programme.

Among the participants, 10 were women entrepreneurs. NESSIA has been playing a major role in encouraging self-employment among the unemployed youth through technology transfer and other means. There are about 7000 entrepreneurs from all over the NE region who are currently recipients of assistance from NESSIA. It is against this backdrop that NESSIA's joining hands with RRL in the programme should be viewed.

The participating entrepreneurs visited the departments such as Medicinal, Aromatic & Other Economic Plants Division and its garden, Cellulose, Pulp & Paper Division, Biotechnology Division,

Workshop and Pilot Plant of the laboratory. They interacted with the scientists on various aspects of RRL technologies. The participants and the scientists of the laboratory met at an interactive discussion on RRL technologies in which scientific experts Shri Dip Saikia, Dr (Smt) Neelima Saikia, Dr P.B. Kanjilal and Dr P.C. Tamuly made presentations on the technologies available at RRL and which are suitable for adoption by the entrepreneurs and also on intellectual property matters. In his Opening Remarks, Dr P.G. Rao, Director, RRL-Jorhat, appealed to the participants to express their minds very frankly, particularly about the difficulties they could foresee while

Foundation Day Celebrations

taking up the RRL technologies so that RRL could assist them in overcoming their difficulties. He also added that the participants could place on record any ideas they have. He informed them that the laboratory would venture to develop new technologies based on such ideas, if required, matching these to the needs of the entrepreneurs. The

laboratory could also try to get the technologies from other CSIR laboratories as well if such technologies are not available at RRL-Jorhat. The only quality required is the quality of entrepreneurship and dedication on the part of entrepreneurs, he said. He profusely thanked the participants for taking active interest in the programme. Shri Amrik

Singh, President, NESSIA thanked the Director and the Scientists of the laboratory for organizing the programme so well. He also lauded the good work done by RRL for entrepreneurial-motivation and development in the region. Certificates were awarded to the participants at the end of the programme. □

NAL celebrates Foundation Day

THE National Aerospace Laboratories (NAL), Bangalore, recently celebrated its 46th Foundation Day with customary enthusiasm. This year's NAL Foundation Day lecture, 19th of the series, was delivered by Shri M. Natarajan, Scientific Adviser to the Defence Minister. The DRDO chief spoke on Opportunities and challenges in defence programmes and projects.

The programme opened with a brief welcome address by Dr A. R. Upadhyaya, Director, NAL. Dr Upadhyaya explained the importance of the day as 'This is a day to celebrate our existence, and our successes. It is also the day when we can greet and thank NAL's past Directors for their visionary leadership and remarkable commitment.' Dr Upadhyaya ended his address by introducing Shri Natarajan, and his many notable contributions to defence R&D.

Shri Natarajan's lecture was a very thoughtful lecture. He covered very wide ground. Starting with the DRDO timeline, he discussed how the organization made the progression from an inspection agency in the 1960's and 1970's to attain the 2005 R&D level featuring production and delivery of sophisticated products such as aircraft, missiles, unmanned aerial vehicles and power plants.

Shri Natarajan talked about DRDO's aerospace programmes. Talking of the efforts to design and develop aeroengines, Shri Natarajan acknowledged that R&D teams were grappling with serious R&D challenges and emphasized that it was essential to quickly build up technological platforms. Looking at the future, Shri Natarajan identified the following niche areas in aerospace: subsonic cruise vehicles, airborne early warning systems, hypersonic aircraft, multi-spectral stealth, smart materials and adaptive structures. In each of these areas, the challenges include: international competition, demanding users, tight delivery schedules, large number of programmes, diverse areas, technology seeding and intelligent collaboration.

Dr S. Viswanath's accompanying lecture on Trends in modeling and simulation of aerospace structures was equally illuminating. The NAL Annual Report for 2004-05 was released on the occasion. Besides ICAST's new website with its associated services was also launched. NAL Foundation Day awards were distributed.

Dr M. R. Nayak, Advisor (M&A), also convenor of the function, proposed the vote of thanks. □

RRL – Jorhat celebrates Foundation Day

THE Regional Research Laboratory (RRL), Jorhat, recently celebrated its 44th Foundation Day. Distinguished invitees, guests, Research Council members, students and teachers besides the scientific community of RRL, both old and new, attended the Foundation Day function. Dr G. Thyagarajan, former Director and Chairman, Research Council of RRL, Jorhat presided over the function. Notable among those present were Dr S. S. Baghel, Vice Chancellor, Assam Agricultural University, Jorhat; Dr Mohan Kumar, Sr Manager (R&D), Tata Tea Ltd, Teok; Air Commdr. M. K. Misra of Air Force Hospital, Jorhat; Dr Ananda Mohan Das, Joint Director of Health Services, Government of Assam and Dr R. K. Mathur, former Scientist G, RRL, Jorhat.

Dr V. Prakash, Director, Central Food Technological Research Institute, Mysore, was the Chief Guest and delivered the Foundation Day lecture on, 'Science and Technology to value add to Human and Agri-resources'. In his lecture, Dr Prakash stressed the need for cost effectiveness in food since food that is produced may go through primary and secondary processing for value addition. When one looks at food, one seldom realizes the journey that the food makes from the farm to the home and how it is handled and how value is added, he remarked. The issues of hygienic quality and safe processed food as well as protection of the environment dictates the efforts to be made by food technologies and



From left : Dr V. Prakash, Director, CFTRI, delivering his Foundation Day Lecture; Dr G. Thyagarajan, former Director and Chairman, Research Council of RRL-Jorhat delivering his Presidential speech and Dr P.G. Rao, Director, RRL-Jorhat delivering his welcome speech

food processing industries in meeting consumer expectations through appropriate Post Harvest Technologies for value addition and productivity. In this connection he also mentioned about the role to be played by women and entrepreneurs. The demand for nutritious and hygienic food is on the increase in recent times and the sole purchaser of the processed food product is the consumer. On the other hand, the populace in general has also realized the essentiality of the protection of the environment. North East India is one of the top biodiversity hot spots of the world. Hence the food processing industry has to honour the views and demands of the consumers. According to Dr Prakash, this entire chain has to be sustainable. There is the question of sustainability of agriculture, the sustainability of

production vs productivity, the sustainability stemming from prevention of losses (especially post-harvest) and the sustainability stemming from encouraging micro-entrepreneurs at rural level. Such micro entrepreneurs also need mega push, underpinning value addition and processes that get adopted at the micro-level which impart value to the local grower, the local farmer and the local seller many more times the value of the raw material in which he trades. In such a system, science and technology can play a phenomenal role. He also mentioned that technology does not always come from science. Sometimes science also comes from technology. It is the path from science to technology or technology to science that is critical. One must work to shorten the distance between the two.

Earlier, Shri J. Parasar, Controller of Administration, RRL Jorhat, welcomed the august audience and spoke briefly about the significance of RRL-Jorhat against the backdrop of North East and also about the achievements it has made so far. Dr P.G. Rao, Director, RRL Jorhat, in his speech outlined the genesis of RRL-Jorhat and touched upon the major achievements made by the

laboratory during 2004.

In his Presidential Address, Dr Thyagarajan appreciated the brilliant lecture delivered by Dr Prakash and urged the scientists of RRL-Jorhat to undertake research work in the areas highlighted by him. Certificates of appreciation were awarded to many staff members for having rendered exemplary service. Certificates were

also awarded to those who excelled in terms of obtaining patents, best research paper published with high impact factor, highest ECF generation, etc. A total of 24 retired colleagues who superannuated during the period 1996 to 2001 were given warm felicitation and mementoes for the contributions they had made for the growth and development of the laboratory. □

Prof Bain delivers the Prof McBain Memorial Lecture at NCL

PROF. Colin D. Bain, Department of Chemistry, University of Oxford, recently delivered the fifth Prof McBain memorial lecture at National Chemical Laboratory (NCL), Pune. Prof Colin Bain spoke on 'Marangoni Effects: Where Surface Chemistry and Fluid Dynamics Meet'. A doyen in the field of colloidal chemistry, Dr James William McBain, F.R.S., Professor of Chemistry, Stanford University, U.S.A., was the first Director of the NCL from 1949 to 1952.

Effect of surfactants on the dynamic interfacial properties is an interesting area of research, both, from the academic and from the industrial point of view. In industry, surfactants influence the stability of turbulent foams, the droplet size in jets and sprays, the spreading of drops on solid surfaces, and the smooth coating of multiple layers in photographic films. Adsorption of surfactants lowers the surface tension and this surface tension gradients cause hydrodynamic flows. This is known as 'Marangoni effect'. The coupling between mass transport and momentum transport greatly complicates the study of both the kinetics of adsorption at free surfaces and Marangoni flows. Prof. Colin Bain's group has designed and used two very simple and elegant methods for generating continuously expanding liquid surfaces under steady-state conditions and studying them. These are (i) the overflowing cylinder (OFC) and the (ii) liquid jet. Of these, the OFC is a unique set-up that allows the usage of several noninvasive experimental probes for the study of surface properties of liquid. For pure water in the OFC, the

radial surface flow is driven by gravity and the free surface is slightly domed. In the presence of surfactants, the surface flow is driven by surface tension gradients and the surface is almost perfectly flat, except near the rim of the cylinder, making the OFC well suited for spectroscopy, reflectometry, and scattering. In this talk Prof. Bain introduced the Marangoni effects to the audience which illustrated the importance of these in several industrial processes with lucid examples. Prof. Bain then went on to explain how the above two simple experimental set-ups along with the noninvasive experimental probes can be used to understand several critical phenomenon such as a quantitative model for the kinetics of adsorption of ionic surfactants to an expanding liquid surface, dynamic surface excess of the cationic as a function of the bulk surfactant concentration and interfacial behaviour of surfactant solutions on short time scales.

Earlier, Dr S. Sivaram, Director, NCL welcomed Prof Bain and also the audience and remembered the contributions of Prof. and Mrs McBain to NCL. A video clipping of inauguration of NCL at the hands of Pandit Jawaharlal Nehru, the first Prime Minister of India and few of the photographs of the Prof McBain were also shown on the occasion.

Dr Sourav Pal, Head, Physical and Materials Chemistry Division, proposed the vote of thanks.

□

CBRI participates *Krishi Shilpa & Banijya Mela*

THE Indian Building Industry as well as building professionals are kept continuously aware of CSIR's presence in the field, mainly due to the extension and mass awareness efforts of the Extension Team of the Central Building Research Institute (CBRI), Roorkee, at a time when the resurgent building industry is in search of S&T support to sustain global competition and also to meet the increasing user demand for economy, quality, content, aesthetics and safety from natural hazards.

To serve the building fraternity of the rural areas, CBRI, has been making special efforts to create awareness of appropriate technologies and materials amongst rural people by way of exhibitions. In this chain of events, CBRI made a significant effort in a far-flung area of West Bengal by way of participation in 'Krishi Shilpa & Banijya Mela' organized by 'Agrayami Handicapped Samity', West Bengal, at Village Ratanpur, Nandigram, Dt. Purba Medinipur, West Bengal.

Coloured photographic descriptions, charts and special exhibits related to technologies/processes on cost effective housing and building materials developed by the Institute appropriate for the region were displayed by CBRI.



Visitors taking keen interest in rural housing technologies developed by CBRI

These were witnessed by thousands of rural people from several nearby villages. Some of the technologies demonstrated included; Clay flyash bricks, flooring and roofing tiles; Foundation in expansive soils; C-Brick making machine; Rural fire protection; Fire retardant curtains; Improved rural house; Low cost sanitary rural latrine; Solid concrete blocks and block making machine; Desirable features for earthquake resistance of Adobe Houses; Cost-effective prefabricated brick panel flooring/roofing systems; High

draught kiln and semi-mechanized brick making machine; Improved lime kiln with pollution control device and Pollution control measures for brick kilns.

The visitors showed keen interest in CBRI technologies, especially in non-erodable mud plaster, clay flyash bricks, rural sanitation, termite control, C-bricks and in technologies for production of pre-cast building components on

small scale.

Shri K. L. Chhabra, Technical Officer, delivered a lecture on 'Cost effective improved rural housing & cottage building industry' to hundreds of villagers. Several government departments and NGOs including Directorate of Marketing and Inspection, Ministry of Agriculture, Government of India, and National Institute of Research on Jute & Allied Fibre Technologies, Government of West Bengal, participated along with CBRI in this important rural event. □

Dr R. K. Chadha elected Secretary-General, Asian Seismological Commission

DR R. K. Chadha, Scientist, National Geophysical Research Institute (NGRI), Hyderabad, was elected unanimously as the Secretary-

General of the Seismological Commission for the period 2004-2008 during the 5th Asian Seismological Commission (ASC) General Assembly. The ASC was

Honours & Awards

formally formed in 1996 under the umbrella of the International Association of Seismology and Physics of the Earth's Interior (TASPEI) to improve the understanding of geological processes in Asia and South Pacific regions and to mitigate earthquake disasters and other related hazards. Dr Chadha has contributed significantly in the field of earthquake studies in the country. He has published 45 research papers in International and National Journals of repute and submitted 30 technical reports related to sponsored projects. Last year, a patent was granted to him and his group for a technique developed for short-term



forecasting of moderate sized earthquakes. He has been a Guest Editor of special issues of two international journals, viz., *Pure and Applied Geophysics* and *Tectonophysics*. After the tsunami of 26 December 2004, he is actively pursuing research on some aspects of the tsunami phenomenon.

Dr Chadha has been a recipient of the National Mineral Award in Geophysics (2003). He also holds several prestigious international positions. He is the Regional Representative of Natural Hazard Society and Member of the IGY+50 Committee of the International Union of Geodesy and Geophysics (IUGG). Dr Chadha also heads the PME Group and the Contract Research Section of NGRI that takes care of the planning and monitoring of NGRI projects and is also involved in developing business in relation to the Contract research projects from Government agencies, Public Sector Units, Multinationals and private companies in India and abroad.



Dr Shakeel Ahmed, receives International Prize for Water Sciences 2004

DR Shakeel Ahmed, Scientist F, at National Geophysical Research Institute (NGRI), Hyderabad, has been honoured at the 7th Cannes International Water Symposium at Cannes, France where he received the trophy of the International Prize for Water Sciences for the year 2004, one of the nine awards called Lights of Water. Dr Ahmed, basically a Geophysicist, chosen to work on applications of geostatistics in Groundwater Hydrology and solved the problem of bridging the gap between field measurement and data requirement for the aquifer model with the development of several multivariate geostatistical methods utilizing easily available parameters. He established an advanced laboratory of Numerical Aquifer Modeling at NGRI. These advanced techniques could help NGRI to complete the first sponsored project in groundwater very successfully. In 1999, the very first Indo-French Collaborative Project was awarded to NGRI by the IFCPAR and Dr Ahmed lead the project as Principal Collaborator from India. Dr Ahmed's collaboration has not been limited to France but he delivered lectures in many countries viz., Australia, Iran, Egypt, Kenya and Pakistan as resource person sponsored by the UNESCO and CSC etc. He has successfully completed a pilot project from UNESCO on studying the variation of fluoride in groundwater recently and also organized a regional training workshop on 'Dynamics of hard rock aquifers' sponsored by the UNESCO. He is closely associated with many International programs like G-WADI network and chairing the International Working Group on Groundwater Monitoring Network Optimization: Geostatistical Approach etc. Dr Ahmed has supervised many doctoral and master theses, notably two doctoral theses of French students that have been awarded by the French Universities. Dr Ahmed has been the Secretary of the National Committee of the International Association of Hydrogeologists and presently he is the Associate Editor of the Hydrogeology Journal published by Springer. He is a life Fellow of the Geological Society of India and member of many professional associations as well as technical committees both National and International, member of the Editorial Board of International Journal of Chemical and Environmental Research. He has published more than 35 research papers in International Journals and presented many papers in reputed conferences.



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