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IITR

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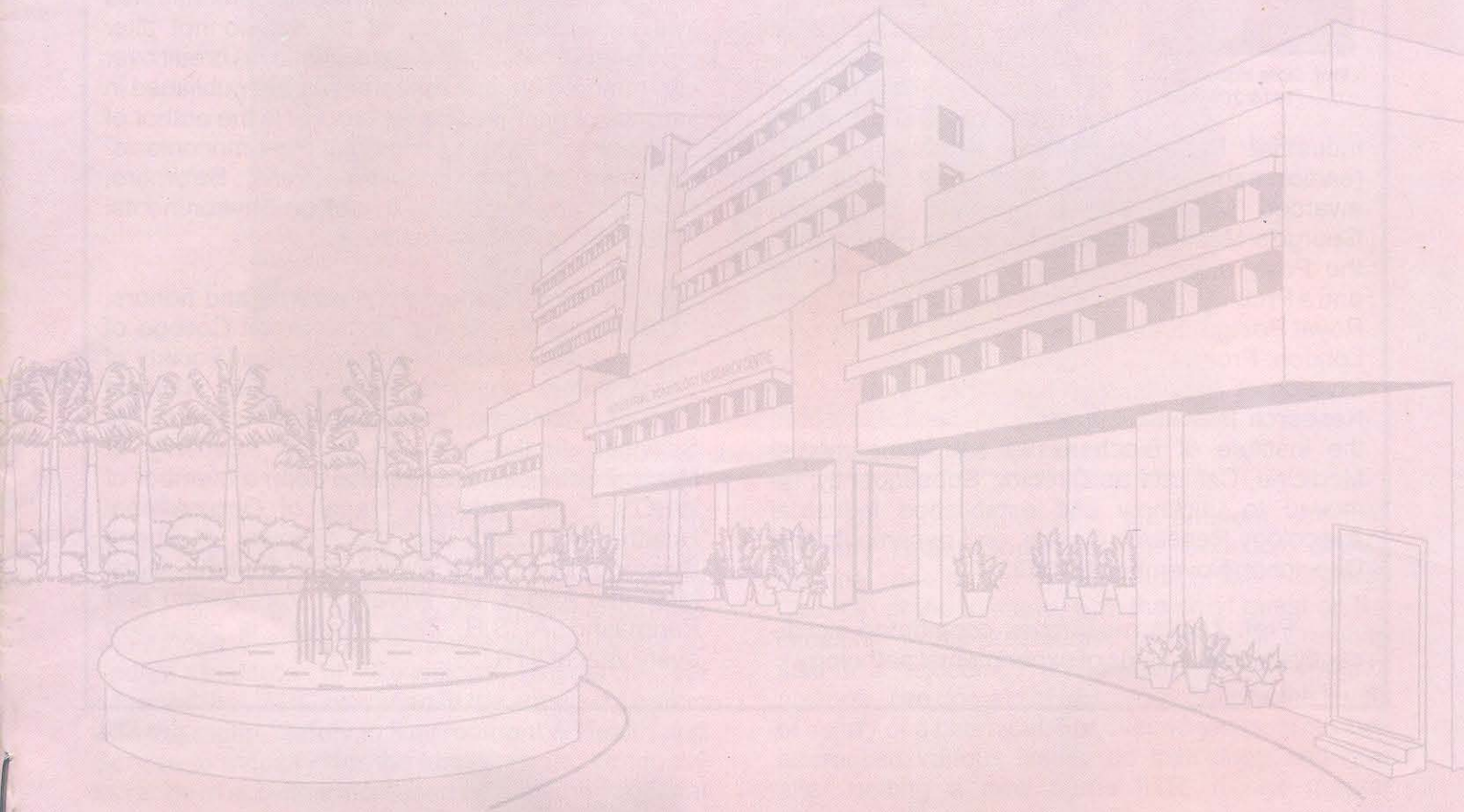


Indian Institute of Toxicology Research, Lucknow
(Formerly: Industrial Toxicology Research Centre, Lucknow)

PROF. S.H. ZAIDI FORMER DIRECTOR, PASSES AWAY

Prof. Sibte Hasan Zaidi (1918-2008)

Professor Sibte Hasan Zaidi, the Founder Director of the Indian Institute of Toxiclogy Rese-arch (IITR), Lucknow, passed away on April 5th 2008 after a long illness. He was an outstanding environmental and indus-trial toxicologist of the country. It was because of his untiring efforts that the Council of Scientific & Industrial Research, India, established IITR (earlier name ITRC) in 1965. Prof. Zaidi was awarded MBBS degree in 1945 from King George's Medical College, Lucknow. He obtained the Postgraduate Diploma in Clinical Pathology and a Ph.D in Experimental Pathology in 1955 from Royal Postgraduate Medical School, University of London. From 1955 to 1964, he served as Head, Division of Experimental Medicine, Central Drug Research Institute, Lucknow. In 1964, he joined the Institute of Biochemistry and Experimental Medicine, Calcutta as Director. Subsequently, he moved to Lucknow and established Industrial Toxicology Research Centre, and became its first Director on November 4, 1965.

Prof. Zaidi's researches contributed significantly to various fields of experimental pathology, with particular reference to occupational lung diseases due to pathogenesis of particulate and fibrous dusts. He demonstrated the role of tuberculosis infection in the causation of pulmonary massive fibrosis in coal miners and fungal Infections in aggravating the fibrotic response in lungs that are exposed to many inorganic and organic dusts. He also demonstrated that in silicosis, nutritional factors do not alter pulmonary fibrosis. Prof. Zaidi has to his credit over one hundred original research papers published in journals of international repute. He is the author of the book entitled "Experimental Pneumoconiosis" published by John Hopkins Press, Baltimore, Maryland and has edited a book on Environmental Pollution and Human Health.

He received numerous awards and honors, including the Fellowship of the Royal College of Pathologists, London, the Pathological Society of Great Britain and Ireland, the Indian National Science Academy, the National Academy of Sciences (India) and the Indian Academy of Medical Sciences. He has also been a member of WHO's Expert Advisory Panel of Occupational Health. Prof. Zaidi was the recipient of Shanti Swaroop Bhatnagar Award, Sir Ardeshir Dalal Memorial Award, Dr. William P. Yant Award and Padmashri. A "S.H. Zaidi Oration" is organised every year at IITR.

ITRC BECOMES IITR

Indian Institute of Toxicology Research (IITR)
Formerly -Industrial Toxicology Research Centre (ITRC)

Renaming ceremony: Dr P.S. Chauhan, unveiling the plaque with the new name IITR

February 1st 2008 was a momentous occasion for everyone at the erstwhile "Industrial Toxicology Research Centre" when the Acting Director of the centre, Dr Ashwani Kumar in his welcome address announced the change in name of the centre to "Indian Institute of Toxicology Research" He informed that ITRC has been in the service of nation with the motto “Safety to Environment & Health and Service to Industry” for the last 42 years. Gradually its range of activities increased beyond the industrial chemicals. The need for change in name was recommended by the Performance Appraisal Board of CSIR, which was subsequently approved by the Governing Body of CSIR. By giving the centre a new name, while the core activity of the 'Institute' will be "Toxicology Research" the scope of activities has now broadened and will include safety evaluation of GM foods, GM drugs, herbal products, nanomaterials and biotoxins, along with existing activities.

Dr. P.S. Chauhan, an eminent scientist, formerly Head, Department of Genetics, BARC, Mumbai and presently Chairman of the "Research Council" of the Institute, was the chief guest on the occasion. In his presidential address, Dr Chauhan said that toxicology is no more the Science of poisons. The domain of toxicology defines the levels of safety of a chemical. For over 40 years, ITRC has addressed various issues on toxicology and now after getting a new name IITR, it has greater responsibilities to perform. The name change now reflects the paradigm shift in the scope of toxicology. The new name plaque was unveiled by Dr. P.S. Chauhan. Eminent scientists from local CSIR laboratories, ex-Directors' of IITR and officials of various scientific institutions were present on the occasion. Dr. Y. Shukla, Dy Director, IITR proposed the vote of thanks.

ITRC CELEBRATED 42nd FOUNDATION DAY

Industrial Toxicology Research Centre (ITRC) celebrated its Foundation Day on November 4, 2007. Earlier in the day, the 11th Prof S.H. Zaidi Oration was delivered by Dr. Amit Ghosh, Director, School of Biological Sciences, Indian Institute of Advanced Research, Ahmedabad. Dr. P.S. Chauhan, Former-Head, Department of Genetics, BARC, Mumbai was the Chief Guest of the occasion. Dr. Ashwani Kumar, Acting Director, ITRC welcomed all the guests, distinguished visitors in the audience and members of the ITRC family. He emphasised that Prof Zaidi was a visionary, he conceptualized and was instrumental in setting up of ITRC and we are holding this oration every year in his honour.

Dr. Amit Ghosh, while delivering oration "Global environmental change and the emergence and re-emergence of infectious diseases: the Cholera Paradigm", said that despite wide spread optimism about the impending demise of the infectious disease, in the middle of the last century microbial threat continues to emerge, re-emerge and

Dr Ashwani Kumar, Acting Director
presenting memento to Dr Amit Ghosh after Zaidi oration

persist. During the last four decades or so, apart from the emergence of about 40 odd new diseases, old diseases like cholera, diphtheria etc, have re-emerged in many parts of the world, from where they were thought to have disappeared long ago. Emergence and re-emergence of infectious diseases are the result of complex interplay of a variety of factors, among which man's interaction with the environment plays a major role. Growing human impact on the environment is altering our planet's geological, biological and ecological systems, giving rise to conditions many of which abet disease emergence.

In his presidential address Dr PS Chauhan said that the founder Director, Prof. SH Zaidi had a vision since he felt the need of establishing a centre which could evaluate the safety of food, chemicals and a variety of substances used in the industry. Dr. Poonam Kakkar, Scientist, ITRC proposed the vote of thanks.

In the evening, the 42nd Foundation Day Function was held in the ITRC lawns. Dr. Ashwani Kumar, Acting Director welcomed the dignitaries Dr. Amit Ghosh, Dr. P.S. Chauhan and the distinguished guests. While presenting the Annual Report of the centre, Dr. Ashwani Kumar said that the period of the report coincided with the completion of tenth five year plan of Government of India and ITRC has successfully completed all the projects of this plan period. During this period 13 Network Projects were completed, besides several in house R&D programmes, a number of grants-in aid, industry sponsored consultancy research and societal programmes were also undertaken during this period. He further said that during the present 11th Five Year Plan, we are undertaking two major research programmes namely, Investigative Toxicology: New Paradigms (Supra Institutional project) and the networked project, Environmental Contaminants: New Screening Technologies and effects on Human Health, where ITRC is the nodal laboratory. Besides these, ITRC will be participating in six other network projects. In order to upgrade our facilities in the emerging areas of toxicology, the facilities for nano-material toxicology and *in silico* toxicity were established. Some significant highlights of the research activities during this period were:

(a) Genetic polymorphism in Indian population for differential response to toxicants and susceptibility to different diseases was studied to identify the population susceptible to squamous cell carcinoma of head and neck in

north Indian population.

(b) PCR protocols were developed for the detection of a transgene in genetically modified maize and RR Soya, which can be applied in other genetically modified food products.

(c) Chemical analysis of repeated fish fried oil showed presence of various carcinogenic polycyclic aromatic hydrocarbons.

(d) Silymarin, a herbal antioxidant showed hepatoprotective effect against hepatotoxicity that was induced by selected drugs like Rifampicin and Pyrogallol in mouse liver.

(e) Water quality variables and major classes of contaminants in samples collected from shallow and deep aquifers from Kanpur city were estimated and it was found that both types of aquifers in industrial areas are considerably contaminated with various chemicals.

(f) A new model of Indian earthworm towards acute toxicity testing of xenobiotics was developed.

In the foundation day address, Dr. Amit Ghosh tried to identify the reasons behind declining interest about science in the students. He said that nowadays the student chooses a subject not because it is his choice but because what others or the society wants him to choose. Thus many people are taking up science as a career not because they are motivated but because what is valued by the society. He stressed on better value system for our younger generation.

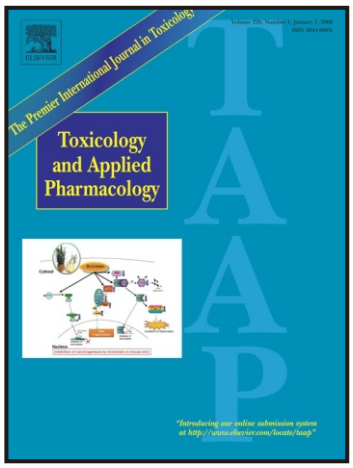
Dr. P.S. Chauhan in his presidential address appreciated the research progress of ITRC, and said that the R&D programmes of the institute should also be technology oriented. He gave an overview of the unprecedented developments in toxicology in the last two decades. He further said that there are certain basic issues in toxicology which need to be addressed namely low and high dose effects and threshold limits among others. Dr. D.K. Saxena, Dy. Director and Chairman of the Organising Committee proposed the vote of thanks.

Releasing the Annual report from L to R Dr DK Saxena, Dr Amit Ghosh, Dr PS Chauhan and Dr Ashwani Kumar

A view of the audience

IITR PUBLICATION APPEARS ON THE COVER OF THE JOURNAL

A Publication "Regulation of p53, nuclear factor KB and cyclooxygenase-2 expression by bromelain through targeting mitogen-activated protein kinase pathway in mouse skin" by Neetu Kalra, Kulpreet Bhui, Preeti Roy, Smita Srivastava, Jasmine George, Sahdeo Prasad and Yogeshwer Shukla has the honour of citation on the cover of journal *Toxicology and Applied Pharmacology* (2008), 226, 3037 published by Elsevier Science. Briefly, it describes Bromelain is a pharmacologically



active compound, present in stems and immature fruits of pineapples (*Ananas cosmosus*), which has been shown to have anti-edematous, anti-inflammatory, anti-thrombotic and anti-metastatic properties. In the present study, antitumorigenic activity of bromelain was recorded in 7,12-dimethylbenz(a)anthracene (DMBA)-initiated and 12-O-tetradecanoyl-phorbol-13-acetate (TPA)-promoted 2-stage mouse skin model. Results showed that bromelain application delayed the onset of tumorigenesis and reduced the cumulative number of tumors, tumor volume and the average number of tumors/mouse. To establish a cause and effect relationship, the proteins involved in the cell death pathway were targeted. Bromelain treatment resulted in upregulation of p53 and Bax and subsequent activation of caspase 3 and caspase 9 with concomitant decrease in antiapoptotic protein Bcl-2 in mouse skin. Since persistent induction of cyclooxygenase-2 (Cox-2) is frequently implicated in tumorigenesis and is regulated by nuclear factor-kappa B (NF-κB), the effect of bromelain on Cox-2 and NF-κB expression was also investigated. Results showed that bromelain application significantly inhibited Cox-2 and inactivated NF-κB by blocking phosphorylation and subsequent degradation of IκBα. In addition, bromelain treatment attenuated DMBA-TPA-induced phosphorylation of extracellular signal regulated protein kinase (ERK1/2), mitogen-activated protein kinase (MAPK) and Akt. It was concluded that bromelain induces apoptosis-related proteins along with inhibition of NF-κB-driven Cox-2 expression by blocking the MAPK and Akt/protein kinase B signaling in DMBA-TPA-induced mouse skin tumors, which may account for its anti-tumorigenic effects.

INTERNATIONAL CONFERENCE ON NANOMATERIAL TOXICOLOGY (ICONTOX 2008)

The International Conference on Nanomaterial Toxicology was jointly organized by Indian Institute of Toxicology Research, Lucknow and Indian Nanoscience Society from February 5-7, 2008. More than 110 participants from 11 countries namely U.S.A., Canada, U.K., Italy, Germany, France, Switzerland, Belgium, Brazil, Finland and India attended the conference. Researchers delivered 54 invited presentations in six scientific sessions and 29 posters were presented during the conference.

At the Inaugural Session on February 5, 2008 Dr. Ashwani Kumar, Acting Director, Indian Institute of Toxicology Research, Lucknow welcomed the delegates. Dr. Mukul Das, President, Indian Nanoscience Society apprised about the genesis of ICONTOX . The conference was inaugurated by the Chief Guest, Prof. A.S. Brar, Vice Chancellor, University of Lucknow. In his Inaugural Address, Prof. Brar mentioned that humans are at greater risk of exposure to nanomaterials which can enter the biological system through different routes. He emphasised the need for safety during synthesis of nanomaterials as well as their release into the environment. A Special Issue of the journal "Nanotoxicology" containing abstracts of the conference was released by him. Dr. Nitya Anand, Former Director, Central Drug Research Institute, Lucknow during his Presidential address remarked that nanomaterials hold a tremendous prospect of use in daily life in diverse fields including delivery systems for drugs, agro-chemicals, cosmetics and for construction. He emphasized the need of proper investigations into the effects of exposure to new nanomaterials on human health.

Dr. Sally S. Tinkle, Chair, NIH Nano Task Force Health Implications working group, NIEHS/NIH, U.S.A. delivered the Nanoscience Oration on *"Harnessing the Power of Nanotechnology for Human Health"*. She also launched the website of Indian Nanoscience Society (www.nanoscience.ac.in) along with Dr. Rishi Shanker, Vice President of the Society and the chairman, scientific programme committee. Prof. James M. Tiedje, Director, Center

for Microbial Ecology, Michigan State University, U.S.A. delivered the Keynote Lecture entitled *"Lessons from the Microbial World for Sustainable Development and Use of Nanomaterials"* during the inaugural session of ICONTOX 2008. He highlighted the principles that are designed to minimize the impact of engineered nanomaterial technology on human health and the environment, with special emphasis on microbes and microbial genomics as potential markers for the purpose. Dr Alok Dhawan, Organizing Secretary, ICONTOX 2008, proposed a vote of thanks.

The first session was on Nanomaterial Synthesis and Characterization. Prof. Pancham Pramanik, Indian Institute of Technology, Kharagpur, set the tone of this session by delivering a Plenary Lecture on *Co-ordination Chemistry for Nano-material Synthesis*. He highlighted the synthesis of nanocatalysts and nanosensors for daily use through interactions between metal ions or molecules of inorganic or organic origin. This was followed by lectures by different speakers on various aspects of nanomaterials. The second session was on Nanomaterials in Pharmaceuticals. The plenary lecture on *Nanoscience and the Design of Medicines* was by Prof. Peter York of Institute of Pharmaceutical Innovations, U.K. He described various methods available to generate nanoparticles of drug substances including microfluidics and sonification techniques. This was followed by an invited lecture of Prof. Denis Labarre of Université Paris Sud, France, on *Modifying Surface Properties can Turn a Foreign Body into a Smart Nanoparticle*.

On the second day, two important sessions on Models and Sensors in *Nanomaterial Safety / Toxicology* were organized. Prof. Marcello Lotti of Università degli Studi di Padova, Italy in his plenary talk on *Short-Term Effects of Particulate Matter: An Inflammatory Mechanism* discussed in detail how the diversity of PM characteristics, dose metrics and endpoints hamper a clear discerning of inflammatory mechanism(s). Dr. Syed A. Hashsham of Michigan, U.S.A. delivered the plenary lecture on *Emerging Genomic Tools for Nanotoxicology*. He discussed the expression arrays, single cell genomics approach to measure low abundance transcripts, high throughput quantitative PCR, genotoxicity assay, and bioinformatic tools enabling enhanced capabilities for functional genomics. There were more than twenty speakers in this session.

Release of Abstracts of ICONTOX 2008 published in Nanotoxicology journal (L-R: Dr. Alok Dhawan, Dr. Mukul Das, Dr. Ashwani Kumar, Prof. A.S. Brar, Dr. Nitya Anand, Dr. Sally S. Tinkle, Prof. James M. Tiedje, and Dr. Rishi Shanker.

On the third day the session entitled "Ethical and Regulatory Issues in Nanomaterial Toxicology" commenced with the plenary lecture *Nanomaterials History, Hype and Hysteria* of Dr. Paul Thorning of University of Bradford, UK. He enlightened the audience with the major therapeutic advances with nanomaterials and nanoparticles in addressing the many challenges of poorly-soluble drugs. The concluding lecture of the session was of Dr. S. Ajmani, VLife Sciences Technologies, Pune on *Understanding Toxicity Aspects of Molecules Using Novel Group Based QSTR (GQSTR) Approach*.

At the Valedictory Session the Chief Guest was Dr. Herald Krug, Switzerland, and Dr. P.S. Chauhan, Presided over the function. Dr. Herald Krug reflected and echoed the appreciation of national and international delegates on the thought provoking deliberations in six sessions. He felt that this would evolve more collaborations and interactions for development and application of strategies for *in vitro* and *in vivo* safety and toxicity assessment of nanomaterials. Dr. P. S. Chauhan lauded the efforts of Indian Nanoscience Society and IITR in organizing ICONTOX-2008, the first conference on Nanomaterial Toxicology in the country. He appreciated the efforts of Indian Nanoscience Society (INS) in publication of abstracts and subsequently selected papers in the Francis & Taylor Journal: Nanotoxicology. Dr. Mukul Das, President INS acknowledged the

Dr. Sally S. Tinkle, and Dr. Rishi Shanker launching the website of the Indian Nanoscience Society.

The Poster Awards of ICONTOX-2008 were presented by Dr. Herald F. Krug and Dr. P.S. Chauhan. (L-R) Awardees in Front Row: Mr. Girish Gupta (CDRI, Lucknow), Mr. Anurag Jyoti (IITR, Lucknow), Ms. Vyom Sharma (IITR, Lucknow), Ms. Virginia D'Britto (NCL, Pune) and Ms. Prachi Joshi (NPL, New Delhi). Rear Row: Dr. Alok Dhawan, Dr. D. K. Saxena, Dr. P.S. Chauhan, Dr. Herald F. Krug Dr. Rishi Shanker and Dr Mukul Das

overwhelming response of delegates from 11 countries to INS's first event-ICONTOX-2008. Dr. Herald F. Krug and Dr. P.S. Chauhan presented the Poster Awards to six participants - Mr. Girish Gupta (CDRI, Lucknow), Mr. Anurag Jyoti (IITR, Lucknow), Ms. Vyom Sharma (IITR, Lucknow), Ms. Virginia D'Britto (NCL, Pune) and Ms. Prachi Joshi (NPL, New Delhi). At the end Dr. Alok Dhawan presented vote of thanks.

CSIR PROGRAMME ON YOUTH FOR LEADERSHIP IN SCIENCE (CPYLS)

On the 29th and 30th of January 2008, Indian Institute of Toxicology Research organized the CSIR Programme on Youth for Leadership in Science (CPYLS). Out of the eighteen students selected from the merit list of U.P. Board, CBSE and ICSE Boards' class X examination of 2007, the following participated in this programme: Aashish Agarwal, Ambuj Singh Gangwar, Anurag, Himanshu Chaturvedi, Keshav Mohta, Nidhi Tripathi, Prashant Tripathi, Pratibha Sharma, Shivendu Mishra, Vineet Pandey, Yutika Singh, (all from BNSD Shiksha Niketan Inter College, Kanpur); Suprabh Shukla (Seth M.R. Jaipuria School, Lucknow), Syed Ali Rizvi (Unity College, Lucknow), Anuj Kumar Singh Sengar (Bal Vikas Sansthan Higher Secondary School, Auraiya) Shanky Jaiswal (Chinmay Vidyalay, Unchahar), Rajat Sharma (St John's School, Varanasi). All the children belonged to the mathematics stream.

The CPYLS programme commenced in the morning with the welcome address of Dr Ashwani Kumar, Acting Director, IITR. While welcoming the students and their parents, he emphasized on the importance of scientific knowledge for the growth of the country. He briefed the gathering about the need of such a programme that was basically meant to encourage class X students to continue their scientific pursuits and interest in science as they prepare for college. He also apprised the students on various areas in which the Institute is working. This was followed by screening of the film, "Battling the Toxicants" which is a window to IITR's research programmes. A talk entitled “Microbes: friends or foes” was delivered by Dr Rishi Shankar. The chief guest, Prof. Susheel Kumar from IIM-Lucknow, delivered a popular lecture on acquiring leadership in science. He captured the attention of everyone as his talk had a generous sprinkling of anecdotes making it an interesting and lively interactive session. Prof Kumar also emphasized on the importance of scientific knowledge for the growth of the country. Dr Sushil Kumar, Dy.Director & Chairman HRDC, proposed a vote of thanks at the

end of the day's programme.

Later, the students were shown various laboratories and facilities in order to acquaint them with modern approaches to toxicology research and also the impact that toxicants and pollutants have on human health at molecular and genetic levels. Techniques for detecting and quantifying chemicals and toxicants and environmental pollutants were shown in the Dyes & Food Adulterants Lab and Environmental Monitoring Division.

On the next day CPYLS students were taken to the Gheru Campus where they interacted with the scientists in the Environmental Chemistry & Waste Water Analysis Lab and were also shown the Animal House Facility. The students also attended a talk delivered by Dr. Dinesh Mohan, Scientist IITR, on Environmental pollution control--issues and challenges. Back in the main campus in the afternoon, the students visited the Herbal Research Lab, Developmental Toxicology, and Photobiology Labs where microassays for high throughput screening of antioxidant potential of natural products, safety evaluation of plastics, and phototoxic effects on seed germination, pollination and using cell lines were demonstrated.

A valedictory function was held later in the e

vening where the students expressed their views on the experience of the two days' programme. The children were impressed and fascinated by the working facilities, the instruments and techniques. While airing their opinions, students expressed their satisfaction and gratitude towards the CPYLS programme. One of the student who had plans of becoming an engineer is “giving it a second thought” now, that is after getting to know the scope in integrating physics, computer science, and mathematics with biology. A suggestion was that such a programme should be accompanied with career counseling prior to class X, so that the students get enough time to decide subjects of their choice. All the students marveled at the patience displayed by scientists in answering their queries. The Chairman, HRDC of the Institute presented mementos and certificates to CPYLS participants and concluded the event with an open invitation to them to visit IITR anytime they wished, interact with scientists here, and also participate in any activity organized by this Institute.

Participants of CPYLS with the Acting Director

RESEARCH HIGHLIGHTS OF IITR

1) Association of genetic polymorphisms in glutathione S-transferases and susceptibility to head and neck cancer.

[Singh M, Shah PP, Singh AP, Ruwali M, Mathur N, Pant MC, Parmar D. 2008. *Mutation Research-Fundamental and Molecular Mechanisms of Mutagenesis* 638:184-194.]

Polymorphism in glutathione S-transferase (GST) genes (GSTM1, GSTT1 and GSTP1) and interaction with environmental factors such as tobacco (smoking or chewing) and alcohol on susceptibility to head and neck squamous cell carcinoma (HNSCC) was studied in a case-control study. The study group consisted of 175 patients suffering from HNSCC and 200 age matched healthy controls. Statistical analysis showed an increase in risk to HNSCC in the patients with null genotype of GSTM1 or GSTT1, though the risk was not found to be significant when adjusted for age, sex, smoking, tobacco chewing or alcohol use by multivariate logistic regression model. The data further showed that combination of deletion genotypes of GST (GSTM1 and GSTT1) confer an even higher risk of HNSCC. Interestingly, GSTP1 wild type genotype in combination with GSTM1 null or GSTT1 null genotype increased susceptibility for HNSCC. Likewise a much greater risk for HNSCC was observed in the patients carrying a genotype combination of GSTM1 null, GSTT1 null and GSTP1 (Ile/Ile). Data have further provided evidence that tobacco chewing and alcohol consumption are the important risk factors for HNSCC. The interaction between tobacco chewing and null genotype of GSTM1 or GSTT1 resulted in about 3.5- and 2.2-fold increase in the risk respectively in the patients when compared to those not chewing tobacco. Alcohol use resulted in more than 4-fold increase in the risk in the patients with null genotype of GSTM1 as compared to those who are non-drinkers. Alcohol consumption also increased the risk (approx. 3-fold) in the cases with null genotype of GSTT1, though the association was not found to be significant when compared to non-drinkers. This data have provided evidence that GST polymorphism modifies the susceptibility to HNSCC and have further demonstrated importance of gene-environment interaction in modulating the risk to HNSCC.

2) Toxic potential of municipal solid waste leachates in transgenic *Drosophila melanogaster* (hsp70-lacZ): hsp70 as a marker of cellular damage.

[Bhargav D, Singh MP, Murthy RC, Mathur N, Misra D, Saxena DK, Chowdhuri DK. 2008. *Ecotoxicology and Environmental Safety* 69:233-245.]

Municipal solid wastes (MSWs) are one of the major sources of environmental pollution. Leachates from these wastes might contaminate the water sources and affect quality of environment. The study was carried out to determine the possible toxic effects of leachates from MSW in transgenic *Drosophila melanogaster* (hsp70-lacZ). Third instar larvae exposed to 1.0-3.0% of these leachates at different time intervals were examined for hsp70 expression, oxidative stress enzyme activities, proteotoxicity, tissue damage along with effect on emergence and reproduction. Maximum hsp70 expression was observed in the larvae exposed to highly acidic leachates. Overwhelming of hsp70 expression in the exposed larvae caused a concomitant decline in total protein content and a significant elevation in oxidative stress enzymes and lipid peroxidation (LPO) product. The leachates caused a significant delay in emergence of flies and affected the reproductive performance of the flies at the tested concentrations. The present study highlights the toxic potential of MSW leachates and the advantage of Drosophila as a model to evaluate the impact of leachates at organismal and cellular levels, also advocating Hsp70 as the first tier indicator of toxicity.

3) Blood levels of polycyclic aromatic hydrocarbons in children of Lucknow, India.

[Singh VK, Patel DK, Ram S, Mathur N, Siddiqui MKJ, Behari JR. 2008. *Archives of Environmental Contamination and Toxicology* 54:348-354.]

Polycyclic aromatic hydrocarbons (PAHs) are compounds with two or more fused benzene rings produced by incomplete combustion of organic substances involved in natural and anthropogenic

processes. Children are exposed to these compounds through inhalation, dietary ingestion, and, also, soil at the playground. It has been well established that PAHs have carcinogenic, mutagenic, and teratogenic effects. Considering possible health risks due to PAHs exposure among children, the present study was carried out in collaboration with the Pediatrics Department, King George's Medical University (KGMU), Lucknow, to determine its exposure in children by estimating blood PAHs levels. Due to the variable composition of PAHs mixtures emitted from different environmental sources, any single compound or metabolite may not be representative of all exposure conditions. For these reasons, the measurement of blood PAHs levels as a possible biomarker, especially of the EPA (Environmental Protection Agency, USA) priority list, has been proposed. Acenaphthylene, anthracene, phenanthrene, fluoranthene, naphthalene, pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and benzo(a)pyrene were determined by HPLC-FD/UV. On the basis of the individual compound, the median (50th percentile) of naphthalene (19 ppb) was highest, however, benzo(a)pyrene (4.0 ppb) level was found to be lowest among all detected PAHs. The median level of total noncarcinogenic PAHs (113.55 ppb) was higher than the total carcinogenic PAHs (32.35 ppb) in blood samples of children. A significant correlation was found between period of time spent in the surrounding breathing zone of the cooking place and total noncarcinogenic PAHs, while the blood carcinogenic PAHs level in children was found to be associated with lower status of their families. It is speculated that there may be chances of health hazards through exposure to PAHs, those not yet declared hazardous and present at higher concentrations in the Indian environment. Further study with a larger sample size and accompanying environmental data is desired to validate the findings of this pilot study and strengthen the database of PAHs exposure in India.

4) Persistence in alterations in the ontogeny of cerebral and hepatic cytochrome P450s following prenatal exposure to low doses of lindane.

[Johri A, Dhawan A, Singh RL, Parmar D. 2008. *Toxicological Sciences* 101:331-340.]

Oral administration of low doses (0.0625, 0.125, or 0.25 mg/kg body weight, corresponding to 1/1400th, 1/700th, or 1/350th of LD50, respectively) of lindane, an organochlorine insecticide, to pregnant dams from gestation day 5-21 was found to produce dose-dependent alterations in the ontogenic profile of xenobiotic-metabolizing cytochrome P450s (CYPs) in the brain and liver of offspring. The increase in the cerebral and hepatic mRNA expression of CYP1A1, 1A2, 2B1, 2B2, and 2E1 was also found to be associated with an increase in the catalytic activity of these CYP isoenzymes in the brain and liver of the offspring at different stages during postnatal development. Interestingly, though the levels of CYPs were several fold lower in brain when compared to the liver, almost equal magnitude of induction in these CYPs in brain have suggested that like in the liver, brain CYPs are responsive to the transplacental induction by environmental chemicals and that the increase is transcriptionally regulated. Moreover, due to its lipophilic nature, lindane may partition in mother's milk leading to further exposure of the offspring during the critical period of neurodevelopment which may explain the increase in CYP mRNA expression and associated catalytic activity especially during the early postnatal period. Interestingly, the increase in mRNA expression of these CYP isoforms was found to persist up to adulthood, suggesting that the low doses of lindane administered to the dams might program the brain and liver of the offspring to persistently express the xenobiotic-metabolizing CYP isoforms. As CYP-dependent metabolism of lindane is involved in its neurobehavioral toxicity, the potential of lindane to imprint the expression of cerebral and hepatic CYPs may help in identifying the role of these enzymes in the developmental neurotoxicity of the pesticide.

5) Association of polymorphism in MDM-2 and p53 genes with breast cancer risk in Indian women.

[Singh V, Rastogi N, Mathur N, Singh K, Singh MP. 2008. *Annals of Epidemiology* 18:48-57.]

Single nucleotide polymorphism (SNP) at position -309 (T309G) in MDM-2 promoter induces tumor formation in the individuals possessing inherited p53 mutations. The present study was undertaken to investigate the association of MDM-2 SNP309, p53 Arg72Pro, and p53 intron-6 G/A polymorphism with total, premenopausal, and

postmenopausal breast cancer risks in Indian women. Genotyping of MDM-2 SNP309, p53 Arg72Pro, and p53 intron-6 G/A in 104 patients and 105 controls was performed either by ARMS-PCR or by polymerase chain reaction and direct sequencing. The p53 Arg72Pro heterozygous variant and in combination with its homozygous variant exhibited a significant protective association with total and postmenopausal breast cancer risk. Neither combined nor homozygous/heterozygous MDM-2 SNP309G was associated with total, premenopausal, or postmenopausal breast cancer risk; however, MDM-2 SNP309G, along with p53 Arg72Pro heterozygous variant, showed a significant protective association with premenopausal breast cancer risk. The results indicate protective associations of p53 Arg72Pro heterozygous variant with postmeno-pausal and MDM-2 SNP309G along with p53 Arg72Pro heterozygous variant with premenopausal breast cancer risk.

6) Detection and characterization of recombinant DNA expressing vip3A-type insecticidal gene in GMOs-standard single, multiplex and construct-specific PCR assays.

[Singh CK, Ojha A, Bhatanagar RK, Kachru DN. 2008. *Analytical and Bioanalytical Chemistry* 390:377-387.]

Vegetative insecticidal protein (Vip), a unique class of insecticidal protein, is now part of transgenic plants for conferring resistance against lepidopteron pests. In order to address the imminent regulatory need for detection and labeling of vip3A carrying genetically modified (GM) products, a standard single PCR and a multiplex PCR assay have been developed. This is the first report on PCR-based detection of a vip3A-type gene (vip-s) in transgenic cotton and tobacco. Assay involves amplification of a 284-bp region of the vip-s gene. This assay can possibly detect as many as 20 natural wild-type isolates bearing a vip3A-like gene and two synthetic genes of vip3A in transgenic plants. The limit of detection as established by the assay for GM trait (vip-s) is 0.1%. Spiking with nontarget DNA originating from diverse plant sources had no inhibitory effect on vip-s detection. Since autoclaving of vip-s bearing GM leaf samples showed no deterioration/ interference in detection efficacy, the assay seems to be suitable for processed food products as well. The vip-s amplicon identity was reconfirmed by restriction endonuclease assay. The primer set for vip-s was equally effective in a multiplex PCR assay format (duplex, triplex and quadruplex), used in conjunction with the primer sets for the npt-II selectable marker gene, Cauliflower mosaic virus 35S promoter and nopaline synthetase terminator, enabling concurrent detection of the transgene, regulatory sequences and marker gene. Further, the entire transgene construct was amplified using the forward primer of the promoter and the reverse primer of the terminator. The resultant amplicon served as a template for nested PCR to confirm the construct integrity. The method is suitable for screening any vip3A-carrying GM plant and food. The availability of a reliable PCR assay method prior to commercial release of vip3A-based transgenic crops and food would facilitate rapid and efficient regulatory compliance

7) Cytoprotective and immunomodulating properties of piperine on murine splenocytes: An in vitro study.

[Pathak N, Khandelwal S. 2007. *European Journal of Pharmacology* 576:160-170.]

Piper longum Linn. and *Piper nigrum Linn*. are conventionally used as immuno-enhancers in Indian system of traditional medicine. The underlying mechanism remains unknown. The present study was therefore, undertaken to delineate the role of piperine (major alkaloid) in cadmium (Cd) induced immuno-compromised murine splenocytes. The various biological determinants such as oxidative stress markers (reactive oxygen species and GSH), Bcl-2 protein expression, mitochondrial membrane potential, caspase-3 activity, DNA damage, splenic B and T cell population, blastogenesis and cytokines (interleukin-2 and gamma-Interferon) were measured to ascertain its cell protective potential. Cadmium induces apoptosis at 6 h onwards. The oxidative stress markers markedly alter prior to a decline in mitochondrial membrane potential, caspase-3 activation and DNA degradation The splenic cell population was observed to change only at 18 h and the release of two cytokines was affected at 72 h. Addition of piperine in various concentrations (1, 10 and 50 mug/ml) ameliorated the above events. The highest dose of piperine could completely abrogate the toxic manifestations of cadmium and

the splenic cells behaved similar to control cells. The reported free radical scavenging property of piperine and its antioxidant potential could be responsible for the modulation of intracellular oxidative stress signals. These in turn appear to mitigate the apoptotic pathway and other cellular responses altered by cadmium. The findings strongly indicate the anti-oxidative, anti-apoptotic and chemo-protective ability of piperine in blastogenesis, cytokine release and restoration of splenic cell population and is suggestive of its therapeutic usefulness in immuno-compromised situations.

8) Protective effect of *Ocimum sanctum* on 3-methyl-cholanthrene, 7,12-dimethylbenz(a) anthracene and aflatoxin B1 induced skin tumorigenesis in mice.

[Rastogi S, Shukla Y, Paul BN, Chowdhuri DK, Khanna SK, Das M. 2007. *Toxicology and Applied Pharmacology* 224:228-240.]

A study on the protective effect of alcoholic extract of the leaves of *Ocimum sanctum* on 3-methylcholanthrene (MCA), 7,12-dimethylbenzanthracene (DMBA) and aflatoxin B, (AFB(1)) induced skin tumorigenesis in a mouse model has been investigated. The study involved pretreatment of mice with the leaf extract prior to either MCA application or tetradecanoyl phorbol acetate (TPA) treatment in a two-stage tumor protocol viz DMBA/TPA and AFB I /TPA. The results of the present study indicate that the pretreatment with alcoholic extract of the leaves of *O. sanctum* decreased the number of tumors in MCA, DMBA/TPA and AFB I /TPA treated mice. The skin tumor induced animals pretreated with alcoholic extract led to a decrease in the expression of cutaneous gamma-glutamyl transpeptidase (GGT) and glutathione-S-transferase-P (GST-P) protein. The histopathological examination of skin tumors treated with leaf extract showed increased infiltration of polymorphonuclear, mononuclear and lympho-cytic cells, decreased ornithine decarboxylase activity with concomitant enhancement of interleukin-1 beta (IL-1 beta) and tumor necrosis factor-alpha (TNF-alpha) in the serum, implying the *in vivo* antiproliferative and immunomodulatory activity of leaf extract. The decrease in cutaneous phase I enzymes and elevation of phase II enzymes in response to topical application of leaf extract prior to MCA, AFB 1, DMBA/TPA and AFB1/TPA treatment indicate the possibility of impairment in reactive metabolite(s) formation and thereby reducing skin carcinogenicity. Furthermore, pretreatment of leaf extract in the carcinogen induced animals resulted in elevation of glutathione levels and decrease in lipid peroxidation along with heat shock protein expression, indicating a scavenging or antioxidant potential of the extract during chemical carcinogenesis. Thus it can be concluded that leaf extract of *O. sanctum* provides protection against chemical carcinogenesis in one or more of the following mechanisms: (i) by acting as an antioxidant; (ii) by modulating phase I and II enzymes; (iii) by exhibiting antiproliferative activity.

9) Prevalence of multi-antimicrobial-agent resistant, Shiga toxin and enterotoxin producing *Escherichia coli* in surface waters of river Ganga.

[Ram S, Vajpayee P, Shanker R. 2007. *Environmental Science & Technology* 41:7383-7388.]

The consumption of polluted surface water for domestic and recreational purposes by large populations in developing nations is a major cause of diarrheal disease related mortality. The river Ganga and its tributaries meet 40% of the water requirement for drinking and irrigation in India. In this study, *Escherichia coli* isolates (n=75) of the river Ganga water were investigated for resistance to antimicrobial agents (n=15) and virulence genes specific to shiga toxin (STEC) and enterotoxin producing *E. coli* (ETEC). *E. coli* isolates from the river Ganga water exhibit resistance to multiple antimicrobial agents. The distribution of antimicrobial agent resistance in *E. coli* varies significantly between the sites. Both *stx1* and *stx2* genes were present in 82.3% of STEC (n=17) while remaining isolates possess either *stx1* (11.8%) or *stx2* (5.9%). The presence of *eaeA*, *hlyA*, and *chuA* genes was observed in 70.6, 88.2, and 58.8% of STEC, respectively. Both LT1 and ST1 genes were positive in 66.7% of ETEC (n=15) while 33.3% of isolates harbor only LT1 gene. The prevalence of multi-antimicrobial agent resistant *E. coli* in the river Ganga water poses increased risk of infections in the human population.

HONOURS AND AWARDS

- Dr. Dinesh Mohan, Scientist in Environmental Chemistry Division at Indian Institute of Toxicology Research (CSIR), Lucknow has been honored with the prestigious **Scopus Young Scientist Award** in Environmental Sciences for the Year 2007 in recognition of his outstanding achievements in the areas of remediation and encapsulation of priority pollutants from water/wastewater, tailoring of activated carbons and/or environmentally benign adsorbents, biomass pyrolysis for the development of bio-fuels (bio-oils), development of environmentally friendly wood preservatives and biorefineries. The award consists of Rs. 50,000 and a citation.

- Miss Ranu Tripathi has been awarded best oral presentation for the paper entitled "Comparative Screening of Heavy metals In Specific Fruit juices: Tetrapacks and Fresh", in the 1st Indian Analytical Science Congress 2007 (Analytical Sciences in the Service of Mankind-a New Paradigm) organized by Indian Society Of Analytical Scientists at R.K.N Engineering College, Nagpur on 28th - 29th December, 2007. (R.Tripathi, A.Srivastava, R.Kumar, D.K.Patel, V.P.Sharma, J.R.Behari)

- Mr. Anurag Jyoti, JRF, Environmental Microbiology was bestowed the '*Poster Award",* in the International Conference on Nanomaterial Toxicology ICONTOX- 2008, held at Indian Institute of Toxicology Research, Lucknow for the paper entitled *"Detection of nucleic acid of diarrhe*agenic *Escherichia coli by gold nanoparticle probes"* (Anurag Jyoti, Pratibha Pandey, S.P. Singh, S.K. Jain, P. D. Dwivedi and Rishi Shanker)

- Miss Vyom Sharma, JRF, Developmental Toxicology was bestowed the *"Poster Award",* in the International Conference on Nanomaterial Toxicology ICONTOX- 2008, held at Indian Institute of Toxicology Research, Lucknow for the paper entitled *"Zinc oxide nanoparticles induce Cytotoxicity and DNA damage in human skin epithelial cell line"* (V. Sharma, R.K. Shukla, N. Saxena, D. Parmar, M. Das and A. Dhawan).

ASSIGNMENT ABROAD

Dr. Jai Raj Behari, Scientist visited Cambodia, Laos and Vietnam from November 3 to 23, 2007 as an expert by FAO to undertake short term assignment to prepare and conduct a workshop on chemical risk assessment.

APPOINTMENTS

Dr. Ravi Ram Kristipati joined IITR, Lucknow, in January 2008 as Scientist Gr. IV(2) in Embryotoxicology Division. Dr. Ravi Ram completed his B.Sc and M. Sc with a specialization in Drosophila Gene-tics from University of Mysore. After completing his Ph.D. with Prof. Ramesh, at University of Mysore, in 2002, he moved to Cornell University, Ithaca, NY, USA to carry out his Postdoctoral Research with Prof. Mariana Wolfner. His research interests centered around understanding the functions of male reproductive proteins using Drosophila as model system with an idea to apply the outcome of research to human fertility and/or insect pest control management. Dr. Ravi Ram has published 15 Research papers in peerreviewed high-impact national/interna-tional journals. Dr. Ravi Ram intends to continue his research on reproductive proteins with a focus on reproductive toxicology.

Dr. Kausar Mahmood Ansari joined as Scientist Gr. IV (1) on January 31, 2008. M. Sc. (Biochemistry) in 1999 from Dr. R M L Avadh University, Faizabad, U.P and Ph.D, (Biochemistry) from University of Lucknow, Lucknow. His doctoral research work was on evaluation of genotoxic and carcinogenic potential of argemone oil/alkaloids. As a Post-doctoral fellow in Department of Carcinogenesis at M D Anderson Cancer Center, USA, he worked on the role and regulation of prostaglandins at molecular level, a mediator of inflammation, in the tumor promotion stage of skin carcinogenesis and published six papers in reputed International journals.

Dr B. R. Achyut joined as Scientist Gr IV (1) in Neurobehavioral toxicology on February 29, 2008. With M.Sc. in Biotechnology, from Indian Institute of Technology Roorkee, in 2003. He completed his Ph.D in Genetics from Sanjay Gandhi Post Graduate Institute of Medical Sciences; Lucknow and studied the association of genetic variants of pro- and antiinflammatory proteins with *Helicobacter pylori* induced gastritis and precancerous lesions. He evaluated the role of host genetic risk factors in the *H. pylori* infection. He has 10 international research papers to his credit.

PROMOTIONS

Dr L.K.S. Chauhan	Gr III(5)	to	Gr III(6)	Shri Shiv Kumar	Gr II(3)	to	Gr II(4)
Dr P.N. Saxena	Gr III(5)	to	Gr III(6)	Shri B.S. Pandey	Gr II(3)	to	Gr II(4)
Dr R.B. Mishra	Gr III(5)	to	Gr III(6)	Shri R.S. Verma	Gr II(3)	to	Gr II(4)
Dr Pradeep Kumar	Gr III(4)	to	Gr III(5)	Shri B.D. Upadhyay	Gr II(3)	to	Gr II(4)
Shri Ashok Kumar	Gr II(3)	to	Gr II(4)	Shri Lakshmi Kant	Gr II(3)	to	Gr II(4)
Shri A.K. Sinha	Gr II(3)	to	Gr II(4)	Smt. A.P. John	Gr II(3)	to	Gr II(4)

SUPERANNUATIONS

Dr GS Gaur Gr IV(4)	31/01/2008	Dr RB Raizada	31/03/2008
Dr Sikander Ali Gr III (5)	31/01/2008	Dr SK Gupta	31/03/2008
Shri Gupta Security Officer	31/01/2008	Mrs. M Joshi	31/03/2008

RESEARCH DIGEST

BIOMEDICINE: GATA DIFFERENTIATE!

Because most cancer deaths are due to metastatic disease, there is great interest in developing therapies that would prevent cells in a primary tumor from undergoing the changes that confer the capacity to disseminate, or that would reverse such changes. Tumors that are destined to disseminate and metastasize display molecular markers that distinguish them from less aggressive cells, but it is not clear if these molecules play a causal role in tumor metastasis, and hence would be suitable drug targets.

Kouros-Mehr *et al*. have explored the role of one intriguing predictive marker in human breast cancer, a transcription factor called GATA-3 that is required for the differentiation and proper function of normal mammary tissue. Breast tumors with low expression levels of GATA-3 typically are poorly

differentiated, have a higher metastatic potential, and are associated with a worse clinical outcome than are tumors with high levels of GATA-3. Studying a mouse model of breast cancer, the authors found that GATA-3 expression and markers of differentiated epithelial cells (red-yellow) were lost very early in tumor progression and that this loss was likely due to the expanded growth of GATA-3-negative mammary stem cells (blue). Importantly, when they reintroduced GATA-3-positive cells into later-stage breast tumors, the tumors became more differentiated and showed a reduced capacity to disseminate. These results indicate that GATA-3 is not only a marker but also a causal factor in tumor metastasis, and that drugs activating GATA-3 itself or the molecules that regulate it could form the basis of differentiation therapy for breast cancer.

SCIENCE, Volume 319,Issue 5867, February 29, 2008

DOES CITY LIFE ALTER BREAST DENSITY?

Epidemiologic studies have found differences between urban and rural women in breast cancer incidence and mortality, both generally being higher in urban areas. Now a British study suggests that women who live or work in urban areas have denser breasts and thus potentially a greater risk of breast cancer, according to a report published online 19 December 2007 ahead of print in *Current Medical Research and Opinion*. The new findings add to the evidence that breast cancer risk is higher in urban settings and may eventuate in new breast cancer screening guidelines.

Breasts are made up of glandular and fatty tissue. Glandular tissue is denser than fatty tissue and harder to read on a mammogram; a higher percentage of dense tissue is also linked with increased risk of breast cancer. A meta-analysis of more than 40 studies published in the June 2006 issue of *Cancer Epidemiology, Biomarkers & Prevention* concluded that women with high breast density have a nearly 5-fold higher breast cancer risk than women with the lowest breast density. The researchers analyzed digital mammograms of 972 women, including 318 women from London and 654 women from outside the capital. The researchers found that women aged 45-54 who lived in central London were twice as likely to have very dense breasts as women who lived in outlying suburban and rural areas. Age-specific analyses indicated that breast density differences by area were more pronounced in women under age 50.

It has been speculated that the observations can be partially attributed to environmental factors such as estrogenic particles present in traffic emissions. However, more research is needed to determine the underlying reasons for this phenomenon, taking into account stress as well as lifestyle and environmental factors. It has been suggested that urban women to be especially vigilant about breast cancer screening and to rely primarily on digital mammography, which is more effective than conventional mammography at detecting cancer in dense breast tissue.

Environmental Health Perspectives Volume 116, Number 2, February 2008

PLASTIC (NOT) FANTASTIC: FOOD CONTAINERS LEACH A POTENTIALLY HARMFUL CHEMICAL

Is bisphenol A, a major ingredient in many plastics, healthy for children and other living things? When exposed to hot water, plastic bottles--including baby bottles--leach a chemical that is known to mimic estrogens in the body. Bisphenol A (BPA) is a ubiquitous compound in plastics. First synthesized in 1891, the chemical has become a key building block of plastics from polycarbonate to polyester. Since 1936 it has been known that BPA mimics estrogens, binding to the same receptors throughout the human body as natural female hormones. Tests have shown that the chemical can promote human breast cancer cell growth as well as decrease sperm count in rats, among other effects. These findings have raised questions about the potential health risks of BPA, especially in the wake of hosts of studies showing that it leaches from plastics and resins when they are exposed to hard use or high temperatures (as in microwaves or dishwashers).

The U.S. Centers for Disease Control (CDC) found traces of BPA in nearly all of the urine samples it collected in 2004 as part of an effort to gauge the

prevalence of various chemicals in the human body. It appeared at levels ranging from 33 to 80 nanograms per kilogram of body weight in any given day. Levels 1,000 times lower than the 50 micrograms per kilogram of bodyweight per day considered safe by the U.S. Environmental Protection Agency (EPA) and the European Union's (E.U.) European Food Safety Authority (EFSA).

Studies suggest that BPA does not linger in the body for more than a few days because, once ingested, it is broken down into glucuronide, a waste product that is easily excreted. Yet, the CDC found glucuronide in most urine samples, suggesting constant exposure to it. It has been suggested that babies likely face the "highest exposure" in human populations, because both baby bottles and infant formula cans likely leach BPA. Other studies since 1976 have shown that small doses (less than one part per billion) of estrogen like chemicals, such as BPA, may be damaging. It has been observed that in fetal mouse prostate receptors can get stimulated with estradiol at about two tenths of a part per trillion, and with BPA at a thousand times higher. In other words, children six years of age were found to have higher levels of BPA's by-product glucuronide in their urine than did mice dosed with the chemical that later developed cancer and other health issues.

The chemical industry argues that unless BPA is proved to have ill effects it should continue to be manufactured and used, because it is cheap, lightweight, shatterproof and offers other features that are hard to match. "There is no alternative for either of those materials [polycarbonate plastics and epoxy resins] that would simply drop in where those materials are used," However, experts opined that there are plenty of other materials, such as polyethylene and polypropylene plastics, that would be fine substitutes in at least some applications. If canned goods or clear plastic bottles are a must, such containers should never be microwaved, used to store heated liquids or foods, or washed in hot water (either by hand or in much hotter dishwashers).

Scientific American, February 19, 2008 Published online 25 February 2008 | Nature | doi:10.1038/news.2008.617

YOUR HISTORY IS PRINTED IN YOUR HAIR: CHEMICAL IMPRINT FROM LOCAL WATER LEAVES AN IDENTIFIABLE 'SIGNATURE'.

The tap water that you drink leaves a 'signature' in your hair that can provide a history of where you've lived, according to researchers. Using these imprints to trace people's past movements may eventually become a common tool for anthropologists and law-enforcement officials. Tell-tale isotope signatures of what we eat and drink are found throughout our bodies in bones, fingernails and hair. Tests of bones in archaeological sites can show whether a person lived and ate locally for years or migrated from elsewhere, and have been used in forensics to help determine where an unknown victim came from. But hair has been of particular interest because it grows steadily: depending on its length, a strand can yield several years of chronicled information about a person's whereabouts. “Bone represents a long-term average and it's constantly being remoulded,” says study author James Ehleringer, a biologist at the University of Utah in Salt Lake City. “Hair is produced sequentially and once it's produced it's never modified.” That feature, says Ehleringer, allows researchers to trace a person's geographic history to an extent. While the technique cannot pinpoint specific locations in which a person has lived, it can narrow the possibilities.

Published online 25 February 2008 | Nature | doi:10.1038/news.2008.617

VITAMIN E SUPPLEMENTATION MAY TRANSIENTLY INCREASE TUBERCULOSIS RISK IN MALES WHO SMOKE HEAVILY AND HAVE HIGH DIETARY VITAMIN C INTAKE

Vitamin E and β-carotene affect the immune function and might influence the predisposition of man to infections. To examine whether vitamin E or β-carotene supplementation affects tuberculosis risk, we analysed data of the Alpha-Tocopherol Beta-Carotene Cancer Prevention (ATBC) Study, a randomised controlled trial which examined the effects of vitamin E (50 mg/d) and β-carotene (20 mg/d) on lung cancer. The trial was conducted in the general community in Finland in 1985-93; the intervention lasted for 6·1 years (median). The ATBC Study cohort consists of 29 023 males aged 50-69

years, smoking at baseline, with no tuberculosis diagnosis prior to randomisation. Vitamin E supplementation had no overall effect on the incidence of tuberculosis nor had β-carotene. Nevertheless, dietary vitamin C intake significantly modified the vitamin E effect. Among participants who obtained 90 mg/d or more of vitamin C in foods (*n* 13 502), vitamin E supplementation increased tuberculosis risk by 72%. This effect was restricted to participants who smoked heavily. Finally, in participants not supplemented with vitamin E, dietary vitamin C had a negative association with tuberculosis risk so that the adjusted risk was 60% lower in the highest intake quartile compared with the lowest. Our finding that vitamin E seemed to transiently increase the risk of tuberculosis in those who smoked heavily and had high dietary vitamin C intake should increase caution towards vitamin E supplementation for improving the immune system.

Harri Hemilä and Jaakko Kaprio, British Journal of Nutrition doi:10.1017/S0007114508923709, Published online by Cambridge University Press 18Feb2008

वैज्ञानिक व्याख्यान श्रंखला 2008

कार्बन क्रेडिट शेयरों का बढ़ता हुआ व्यापार-भारतीय वैज्ञानिकों के लिए चुनौतियों एवं असीम संभावनायें

आजय कुमार माथुर, वैज्ञानिक-एफ सीमैप, लखनऊ

वर्ष 2007, इतिहास के पन्नों में मानव द्वारा विश्वव्यापी तापक्रम वृद्धि (Global Warming) के खिलाफ छेड़ी लड़ाई द्वारा ''पृथ्वी बचाओं'' अभियान में एक मील के पत्थर के रूप में दर्ज हुआ। 190 देशों के 10 हजार प्रतिनिधियों ने बाली (इण्डोनेशिया) सभा में एक कानूनी प्रावधान पर हस्ताक्षर किये जिसके अनुसार विश्व के 36 सबसे विकसित देश (जो संसार में फैल रहे प्रदूषण के 73 प्रतिशत भाग के लिए जिम्मेदार है) वर्ष 2008 से 2012 तक आपने द्वारा कार्बनडाई आक्साइड उत्सर्ग (emission) के स्तर में 1990 के उत्सर्ग स्तर के मुकाबले 5.2 प्रतिशत एवं 2012-2020 तक 25 से 40 प्रतिशत तक कम स्तर पर ले जायेंगे। इन प्रावधानों का मसौदा 1999 में हुई क्याटो (जापान) सभा में तैयार किया गया था तथा बाली उदघोषणा के बाद इस पर अमल करना हर देश की कानूनन बाध्यता हो गई है। इस बाध्यता को पूरा करने के लिए हर विकसित देश ने अपने यहां स्थित मुख्य CO_2 उत्सर्ग कर रही इकाईयों के लिए अधिकतम् उत्सर्ग की मात्रा निश्चित कर दी है। क्याटो प्रावधान के अनुसार यदि कोई कम्पनी अपने लिए निर्धारित कोटे से ज्यादा CO_2 का उत्सर्ग करती है तो उसे विकासशील देशों से इसके बराबर के कार्बन क्रेडिट खरीदने पड़ेंगे। यह कार्बन क्रेडिट या तो CO_2 के उत्सर्ग को रोककर या उत्पन्न हुई CO_2 को पुनःचक्रण (Recycling/sequestering) द्वारा वातावरण से सोखकर उत्पन्न किये जाते हैं।

कार्बन क्रेडिट के इस नये व्यापार ने भारत एवं चीन जैसे विकासशील देशों के लिए धन अर्जित करने की असीम संभावनाओं को जन्म दे दिया हैं। एक कार्बन क्रेडिट का मतलब 1.0 टन CO_2 को वातावरण में जाने से रोकना है। वर्तमान में एक कार्बन क्रेडिट शेयर का मूल्य 12.80 यूरो है वर्ष 2006-07 में कुल 2.1 अरब कार्बन क्रेडिट शेयरों (32 अरब डालर के बराबर) का व्यापार हुआ। 2018 तक यह व्यापार 81 प्रतिशत वृद्धि दर से 58 अरब डालर तक पहुंचने का अनुमान है। आज यह शेयर संसार के सभी बड़े विनिमय केन्द्रों (Stock Exchanges) पर खरीदने और बेचनें के लिए उपलब्ध है। कार्बन क्रेडिट व्यापार का विस्तार हमारे दैनिक जीवन की क्रियाकलापों पर व्यापक असर डालेगा। सबसे प्रथम हमकों अपनी जीवन शैली में बदलाव लाकर अपना कार्बन पद चिन्ह (Carbon footprints) संकरा करना होगा। इसके लिए सौर ऊर्जा, वायु ऊर्जा, या वृक्षारोपण जैसे वैकल्पिक साधनों को अपनाना पड़ेगा। प्रत्यक्ष (जैसे बिजली का उत्पादन एवं प्रयोग, परिवहन साधन) या अप्रत्यक्ष (भागने वाली वस्तु के बनने में) रूप CO_2 उत्सर्ग करने वाली हर क्रिया को अधिक ऊर्जा दक्ष (Energy efficient) बनाना होगा। CFL का अत्यधिक प्रयोग वर्मीकम्पोस्टिंग, कार क्लबों का बनना, बायोडीजल का प्रयोग, हरित रसायन विधियों का प्रयोग, हरित भवनों का निर्माण, जैविक पदार्थों की अभियांत्रिकी, जैविक प्लास्टिक का प्रयोग, मित्रवत् जीवाणुओं की खोज, प्राकृतिक तंतु (Natural Fibre) का निर्माण आदि जैसे बहुत से नये विकल्पों की खोज हम वैज्ञानिकों के लिए नई नवीन चुनौतियां होंगी।

इस व्याख्यान द्वारा कार्बन क्रेडिट व्यापार के स्वरूप और प्रदूषण से धन अर्जित करने के विभिन्न पहलुओं पर विवेचना करने का प्रयास किया गया।

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Any feedback on this publication is welcomed.
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