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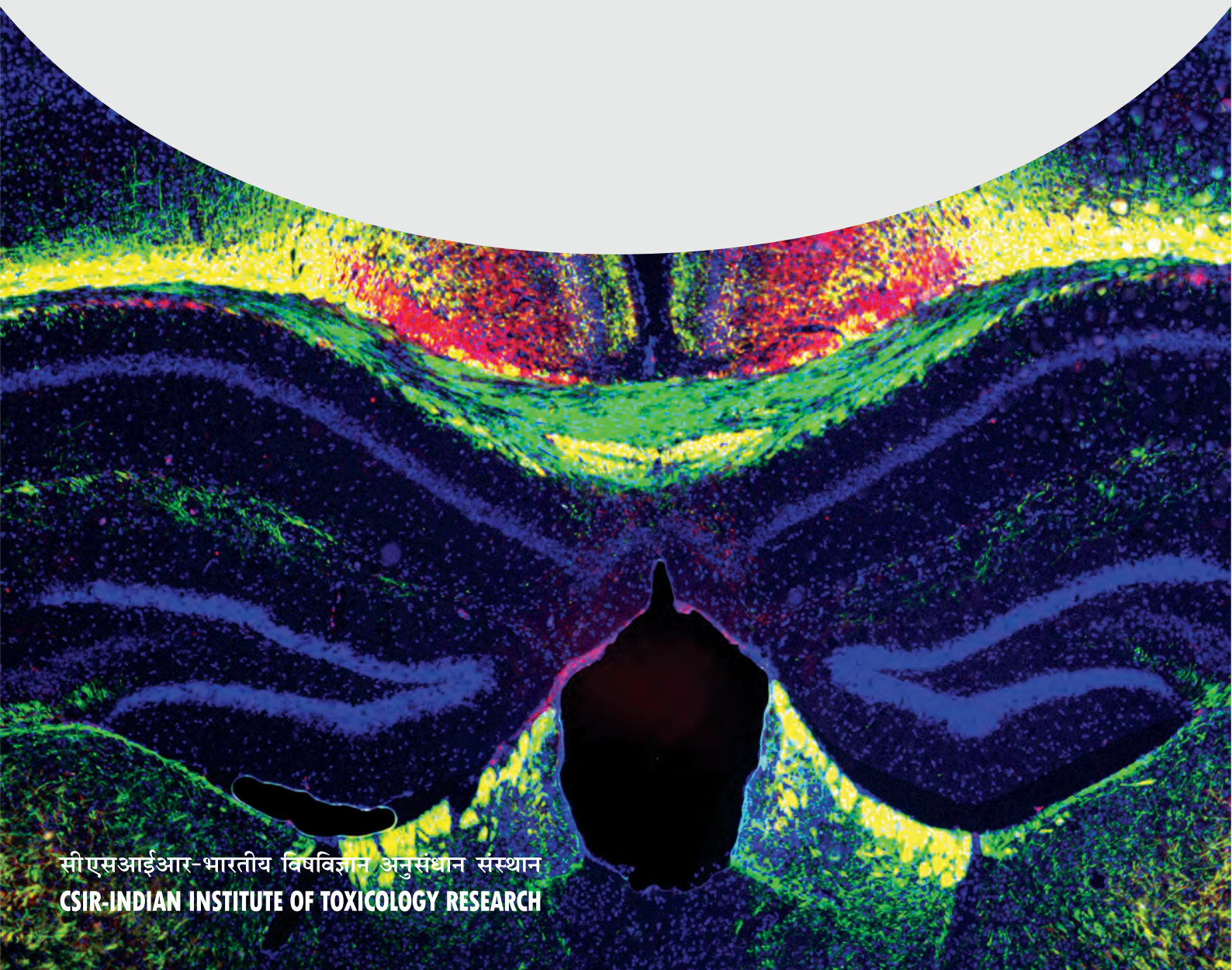
YEARS

CSIR-IITR

Annual Report 2019-20



सीएसआईआर-भारतीय विषविज्ञान अनुसंधान संस्थान

CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH


Hand Sanitizer


उत्तर प्रदेश के राज्यपाल
हैंड सेनिटाईजर
Hand Sanitizer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Annual Report
2019-20

CSIR-Indian Institute of Toxicology Research
Vishvigyan Bhawan, 31, Mahatma Gandhi Marg
Lucknow - 226 001

Editorial Committee

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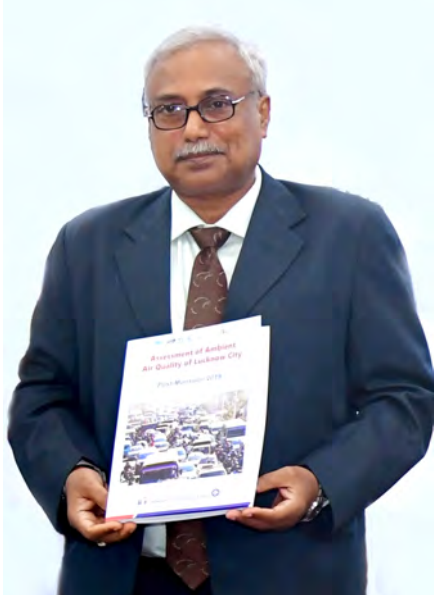

From the Director's Desk

It is a matter of great pleasure for me to present to you the 2019-2020 annual report of the CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow. This report highlights the scientific achievements of the institute during this period and also provide a prospect to gauge our development to step forward.

CSIR-IITR, a Global leader in toxicology research for more than five decades has been providing S&T interventions with the motto "Safety to Environment and Health and Service to Industry". CSIR-IITR is one of its kind in India and among a few in the world, which has contributed immensely to occupational, industrial and environmental toxicology as well as for improving human health. CSIR-IITR conducts research in the niche areas of toxicology such as - Systems Toxicology & Health Risk Assessment; Food, Drug & Chemical Toxicology; Regulatory Toxicology; Environmental Toxicology; Computational Toxicology and Nanomaterial Toxicology. The institute has enriched the knowledge repertoire of toxicology by contributing 75 research articles with an average impact factor of 5.97. Of these, ~80% of the publications are in the range of impact factor >3 and about 40% publications in the range of impact factor 5 and above. Also, various monographs, books, copyrights, environmental air and water quality survey reports, awareness pamphlets (multilingual) and scientific contents in Hindi have positioned CSIR-IITR on the forefront of societal relevance.

CSIR-IITR has been working on research for the policy which has resulted in guidelines/standards for national regulatory agencies. CSIR-IITR contributed to the formulation of Guidelines for Evaluation of Nano-based Agri-Input and Food Products in India and Guidelines of CPCSEA for Reuse/Rehabilitation of Large Animals post experimentations 2020. CSIR-IITR has participated in the Global Burden of Disease Consortium and has published one article in Nature this year. Further we have embarked upon filed nine patents as a new technologies and sensor development which would be of help in risk assessment of food adulteration/contamination and automated air quality monitoring. CSIR-IITR is now embarking upon futuristic areas of toxicology including 3D printed tissues/organs, artificial intelligence, machine learning and alternate to animal models in toxicology to help the MSME sectors.

In March 2020, CSIR-IITR received funding from BIRAC-BioNEST to support to foster the scientific entrepreneurship for nurturing innovative technology based solutions for start-ups and industries. This project provide researchers, innovators, and entrepreneurs from academia and industry for accessing state-of-the-art platform technologies and mentorship in a multi-disciplinary collaborative environment to innovate, develop, probe and translate the most important technological challenges facing health and the environmental sectors.

CSIR is making a comprehensive and harmonious efforts to respond on COVID-19 pandemic under five verticals such as Digital and Molecular Surveillance, Rapid and Economical Diagnosis, Development of Repurposed Drugs/New Drugs & Vaccine, Hospital Assistive Devices and PPEs and Supply chain Management. CSIR-IITR progressing and making efforts in all five verticals, particularly made significant contributing to RT-PCR based COVID-19 testing and handrub sanitiser. A Lucknow based startup has been incubated at CSIR-IITR BIRAC-BioNEST centre for the preparation of hand sanitizer and developing disinfection solutions.

The mission mode programme led by CSIR-IITR on food safety and consumer solution instrumental in initiating CSIR and FSSAI for Collaborative Research and Information Dissemination regarding Food and Nutrition. Dr Harsh Vardhan, Union Minister for Health and Family Welfare presided the signing of MoU between Food Safety and Standards Authority of India (FSSAI) under Ministry of Health & Family Welfare and Council of Scientific & Industrial Research (CSIR) under Ministry

of Science & Technology on Aug 7th, 2020. The MoU with CSIR will enable FSSAI to identify existing and novel technologies and programs, collect data regarding food consumption, incidence and prevalence of existing emerging risks, develop a rapid-alert system and strengthen the quality assurance laboratory network for this purpose.

CSIR-IITR along with National Skill Development Corporation (NSDC) and Life Sciences Sector Skill Development Council (LSSSDC), Government of India, under the CSIR-Integrated Skill initiative has organized the skill development programme "Environment, Health and Safety Manager (LFS/Q0214)" from 3rd to 25th February, 2020. "Analytical Toxicology" being offered jointly by CSIR-IITR and Hindu College, University of Delhi, under the umbrella of CSIR Integrated Skill Development Initiative.

As part of SSR, we regularly interact with the school students, bring them to our institute and infuse them to develop a small exploratory programmes as a part of CSIR-Jigyasa. More than 200 participants benefited from the skill development programmes on environmental safety assessment techniques, and food safety and 115 students and faculties participated in summer research Training Programme - 2020.

On the occasion of the World Environment Day, CSIR-IITR organized The XXIV Dr. C.R. Krishna Murti Memorial Oration delivered by Dr R.A. Mashelkar, FRS, National Research Professor, and Former DG, CSIR and institute released report on "Assessment of Ambient Air Quality of Lucknow City: Pre-Monsoon 2020".

During the year, team CSIR-IITR took prominent actions in Ganga Aamantran, the river rafting expedition from Devprayag to Ganga Sagar not only awareness campaign but also testing water samples along the way for improving quality of living on river basin and around.

I should also like to inform you that in the year 2019-20, CSIR-IITR received prestigious Golden Peacock Eco-Innovation Award for the year 2020 for the development of impactful clean potable water technology "ONEER".

Overall, the institute devoted its focus to prolifically leverage R&D portfolio of CSIR-IITR leads to the development of fundamental and translational research, scientific social responsibility and public outreach, strengthening country's policy framework, serving industries and innovative technology development for various causes of the societal health and the benefit of masses.

(Alok Dhawan)

CSIR-IITR Organizational Chart

Director General CSIR

Research Council — **Director** — **Management Council**

R & D Areas

- Environmental Toxicology
- Food Drug & Chemical Toxicology
- Nanomaterial Toxicology
- Regulatory Toxicology
- Systems Toxicology & Health Risk Assessment

Facilities

- Technology Development & Innovation Centre (TDIC)
- Centre for Innovation and Translational Research (CITAR)
- National Facility for Nanotoxicology
- National Facility for Food Safety
- National Reference Laboratory for Food Safety & Referral Food Laboratory (FSSAI)
- DSIR-IITR-CRTDH Environmental Monitoring & Intervention Hub
- BIONEST-BIRAC

S & T Units

- Research Planning & Business Development
- Analytical Chemistry
- Animal Chemistry
- Computer Cell
- Service & Maintenance Unit
- Knowledge Resource Centre
- Quality Assurance Unit (NABL)
- Toxicity Testing : GLP Test Facility
- Human Resource Development

Administration

- Establishment
- Finance & Accounts
- Stores & Purchase
- Engineering Unit (Civil)
- Engineering Unit (Elect & Mech.)
- Security
- Canteen

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Golden Peacock Eco-Innovation Award (GPEIA) 2020

CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow has been awarded the prestigious Golden Peacock Eco-Innovation Award (GPEIA) 2020 for its technology entitled "Oneer - A Novel and Affordable Solution for the Safe Drinking Water". The Golden Peacock Awards were set up by the Institute of Directors (IOD), India in 1991 and for this year the Awards Jury was constituted under the Chairmanship of Hon'ble Justice M. N. Venkatachaliah, former Chief Justice of India, Chairman, National Human Rights Commission of India and National Commission for Constitution of India Reforms. Oneer, the winner of GPEIA 2020, is a unique patented and highly affordable water disinfection system which has potential for use in residential household communities where the potable water requirement is at mid- to large-scale 5000-100000 liters per day. It is an innovative technology that eliminates all the diseases causing pathogens (7 log reduction) such as virus, bacteria, fungi, protozoa and the cyst to provide safe drinking water to communities as per National and International standards prescribe for potable water by Bureau of Indian Standard (BIS), World Health Organization (WHO), and Environmental Protection Agency (EPA). In the year 2018, the technology has been licensed to two private parties (M/s SS Maser Technology Private Limited, Lucknow and M/s Bluebird Pure Private Limited, New Delhi) on non-exclusive basis.

Graetz, N., Woyczynski, L., Wilson, K.F. et al. Local Burden of Disease Educational Attainment Collaborators. Mapping disparities in education across low- and middle-income countries. Nature 577, 235-238 (2020). https://doi.org/10.1038/s41586-019-1872-1

- Educational attainment is an important social determinant of maternal, newborn, and child health.
- GBD collaborators have worked from the available Sustainable Developmental Goals (SDGs) evidence from different countries by estimating the subnational distribution of educational attainment, including the proportions of individuals who have completed key levels of schooling, across all low- and middle-income countries from 2000 to 2017.
- No previous studies have analyzed the subnational proportions of individuals who completed specific levels of education across all low- and middle-income countries.
- The inequalities within the population in India for educational attainment was also observed in the study. Using geolocating subnational data for more than 184 million person-years across 528 data sources, inequalities in educational attainments was evidenced across geography as well as within populations.

डॉ सुमीत जैरथ, आई.ए.एस.
सचिव
Dr. SUMEET JERATH, I.A.S.
Secretary

सत्यमेव जयते

भारत सरकार
राजभाषा विभाग
गृह मंत्रालय
GOVERNMENT OF INDIA
DEPARTMENT OF OFFICIAL LANGUAGE
MINISTRY OF HOME AFFAIRS

अ.शा.प.सं. 11014/05/2020-रा.भा.(प.) दिनांक: 14 अक्तूबर, 2020

प्रिय प्रो० आलोक धावन जी,

मुझे आपको यह सूचित करते हुए अपार हर्ष और गर्व का अनुभव हो रहा है कि आपके कार्यालय द्वारा प्रकाशित गृहपत्रिका **'विषविज्ञान संदेश'** को **वर्ष 2019-20** के लिए **राजभाषा कीर्ति पुरस्कार (गृहपत्रिका)** के अंतर्गत **'क'** क्षेत्र में **द्वितीय पुरस्कार** प्रदान किया गया है।

2. राजभाषा के प्रचार-प्रसार की दिशा में आपके मंत्रालय/विभाग द्वारा प्रकाशित गृहपत्रिका अतुलनीय योगदान दे रही है और राजभाषा विभाग, गृह मंत्रालय आपसे अपेक्षा करता है कि आप इसी प्रकार उत्कृष्ट गृहपत्रिका के प्रकाशन से दूसरे कार्यालयों के लिए प्रेरणास्त्रोत का कार्य करते रहेंगे।

3. कोरोना महामारी से उत्पन्न अप्रत्याशित संकट की स्थिति के कारण जनहित को प्राथमिकता देते हुए इस वर्ष हिंदी दिवस पर दिये जाने वाले 'पुरस्कार वितरण समारोह' का आयोजन नहीं किया जा रहा है और इस वर्ष के पुरस्कार आगामी वर्ष में हिंदी दिवस के आयोजन के दौरान देने का विचार किया गया है।

4. मेरा विश्वास है कि आपके कुशल नेतृत्व में पत्रिका **'विषविज्ञान संदेश'** इसी प्रकार अपने लक्ष्यों को प्राप्त करती रहेगी और राजभाषा हिंदी के न केवल प्रगामी प्रयोग अपितु अधिकतम प्रयोग को सुनिश्चित कर आप अपना संवैधानिक दायित्व पूर्ण करते रहेंगे।

जय राज भाषा! जय हिंद!

शुभेच्छु

सुमीत जैरथ
14/10/2020

(डॉ. सुमीत जैरथ)

प्रोफेसर आलोक धावन,
निदेशक,
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भारतीय विष विज्ञान अनुसंधान संस्थान,
31 महात्मा गांधी मार्ग, लखनऊ - 226001

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सबका साथ, सबका विकास, सबका विश्वास
Sabka Saath, Sabka Vikas, Sabka Vishwas

डॉ हर्ष वर्धन
Dr Harsh Vardhan
स्वास्थ्य एवं परिवार कल्याण, विज्ञान और प्रौद्योगिकी व पृथ्वी विज्ञान मंत्री, भारत सरकार
Union Minister for Health & Family Welfare, Science & Technology and Earth Sciences Government of India

संदेश

मुझे यह जानकर अत्यंत हर्ष हुआ कि सीएसआईआर-भारतीय विषविज्ञान अनुसंधान संस्थान, लखनऊ की राजभाषा पत्रिका "विषविज्ञान संदेश" को केन्द्रीय गृह मंत्रालय ने पुरस्कृत किया है। इस उपलक्ष्य में विगत कुछ महीनों में संस्थान में हिन्दी के उपयोग, वैज्ञानिक गतिविधियों में हिन्दी के इस्तेमाल और दूरदर्शन के विभिन्न चैनलों में हिन्दी में वैज्ञानिक दृष्टिकोण के प्रसार के सफल प्रयासों को संस्थान की वार्षिक रिपोर्ट में सम्मिलित कर इसे प्रकाशित करने का निर्णय सराहनीय है। हिन्दी में समृद्ध वार्षिक रिपोर्ट के लिए संदेश का अनुरोध प्रासंगिक है।

मुझे संस्थान में हिन्दी के उत्कृष्ट उपयोग की विस्तृत जानकारी मिलने पर गर्व हुआ कि वैज्ञानिक कार्य में संलग्न एक संस्थान राजभाषा हिन्दी को प्रोत्साहित करने में भरसक प्रयास कर रहा है। यदि इसी उत्साह और जज़्बे से सभी सरकारी कार्यालयों और संस्थानों में कार्य किया जाए तो निश्चित रूप से राजभाषा हिन्दी की स्वीकार्यता और गौरव बढ़ेगा।

मैं संस्थान की वार्षिक रिपोर्ट के सफल प्रकाशन के लिए अपनी शुभकामनाएं प्रेषित करता हूं।

(डॉ. हर्ष वर्धन)

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कलराज मिश्र
राज्यपाल, राजस्थान

Kalraj Mishra
Governor, Rajasthan

संदेश

मुझे यह जानकर प्रसन्नता है कि सीएसआईआर–भारतीय विषविज्ञान अनुसंधान संस्थान द्वारा राजभाषा पत्रिका 'विषविज्ञान संदेश' को गृह मंत्रालय, भारत सरकार द्वारा पुरस्कृत किये जाने के उपलक्ष्य में संस्थान की वार्षिक रिपोर्ट का प्रकाशन किया जा रहा है।

यह जानना सुखद है कि भारतीय विषविज्ञान अनुसंधान संस्थान वैज्ञानिक शोध गतिविधियों के साथ ही विषविज्ञान में नवीनतम अनुसंधान, स्वास्थ, जल–वायु एवं पर्यावरण और अन्य वैज्ञानिक विषय से संबंधित जानकारियां हिंदी में आम जन तक पहुंचाने के लिए भी महती कार्य कर रहा है।

हिंदी भाषा नहीं, भारतीय संस्कृति है। मेरा ऐसा विश्वास है कि नवीनतम शोध–अनुसंधान और ज्ञान–विज्ञान को हिंदी भाषा में उपलब्ध कराने से भारतीय जीवन मूल्यों, हमारी विरासत व्यापक पाठक वर्ग तक पहुंच सकती है।

चरक संहिता जैसे भारतीय ग्रंथों में पौधों की ऐसी विरल प्रजातियों की जड़ी–बुटियों का उल्लेख हैं जो विषाक्त होती है परन्तु रोगोपचार में उनके महत्ती योगदान को भी बताया गया है। विष विज्ञान किसी भी पदार्थ के सुरक्षित उपयोग को निर्धारित करने में महत्वपूर्ण है। इसी दृष्टि से इससे संबंधित ज्ञान का प्रसार अधिकाधिक हिन्दी में होगा तो इसका वृहद स्तर पर आम जन को लाभ मिल सकेगा। पवित्र गंगा को प्रदूषण मुक्त करने, हिमालय की जैव विविधता के संरक्षण और धरती के पारिस्थितिकी तंत्र के संतुलन में वैज्ञानिक प्रयासों को अधिकाधिक रूप में हिन्दी में आना चाहिए।

आप द्वारा प्रेषित 'विषविज्ञान अनुसंधान के नये आयाम' पुस्तक और राजभाषा पत्रिका से आपके किए कार्यों के बारे में विस्तार से जानकारी मिली है। इनके माध्यम से यह जानना प्रसन्नतादायक है कि विषविज्ञान अनुसंधान संस्थान विषविज्ञान में आधुनिक अनुसंधान हेतु नवाचारों को निरन्तर प्रोत्साहन दे रहा है।

प्रकाश्य वार्षिक रिपोर्ट संस्थान के वैज्ञानिकों, कर्मचारियों द्वारा हिंदी में किए उत्कृष्ट कार्यों को व्यापक पाठक वर्ग तक पहुंचाएगी, ऐसा विश्वास है।

हार्दिक शुभकामनाएं।

(कलराज मिश्र)

राज भवन, सिविल लाइन्स, जयपुर–302006
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दूरभाष : 0141–2228716–19, 2228611–12, 2228722

Ganga Amantaran Yatra Flag-in

The flag-in ceremony of the Ganga Amantaran Abhiyan was organized by National Mission for Clean Ganga (NMCG) on 13th March, 2020, in New Delhi. The event was chaired by Hon'ble Minister of Home Affairs Shri Amit Shah. The ceremony was attended by various government officials like Jal Shakti Minister, Shri Gajendra Singh Shekhawat, MoS Jal Shakti, Shri Ratan Lal Kataria and other eminent dignitaries. It was focused on implementing various approaches and acting decisively in the direction to revive and rejuvenate Ganga River. Prof. Alok Dhawan, Director CSIR-IITR was present on the occasion to uplift the contribution of CSIR-IITR in the month-long expedition.

Professor Alok Dhawan with Hon'ble dignitaries

11th National Street Food Festival

To ensure availability of safe, healthy, sustainable and wholesome food for the Indian citizens, FSSAI has begun a large-scale effort to transform the country's food system through the 'Eat Right India' movement. The tagline 'Sahi Bhojan. Behtar Jeevan', thus, forms the foundation of this movement. As part of the Eat Right India movement, the 'Eat Right Mela' was conceived to engage, excite and enable citizens to eat right through an info-tainment model. Eat Right Meals have been envisioned for massive outreach to build awareness on safe food and healthy diets through an interactive and informative model. Eat Right Mela was held during 25th – 29th December 2019 at Jawaharlal Nehru Stadium, New Delhi. This 4-day Mela gave a complete food experience that included advice on safe food and healthy diets by dieticians, exhibits on healthy diets, showcases of innovations by the food industry and FSSAI, dialogues and conversations with food visionaries and experts, delicious street food from all corners, live cooking demonstrations by renowned chefs, and plenty of fun and entertainment. Dr Harshvardhan, the Minister of Science and Technology, Minister Health and Family Welfare and Minister of Earth Science inaugurated the second edition of Eat Right Mela and said that the right kind of diet will help to reduce the disease burden in the country. There were over 125 food stalls from different states of India presenting popular street foods. This year the focus was on “Healthier Diets” which elaborated the concepts of reducing consumption of High Fat, Salt and Sugar; eliminating trans-fats; increasing the consumption of fortified staples and choosing local and seasonal produce.

Another interesting pavilion was 'Food Safety 'primarily focusing on FSAN (Food Safety and Applied Nutrition) by demonstration of rapid food testing kits/devices of various government institutions/laboratories categorized into milk and milk products, salt and oils, meat and fish products and cereals, pulses, fruits & vegetables and beverages. Thus the Eat Right Mela was an effort to mainstream the key messages of the 'Eat Right India Movement" – safe, healthy and sustainable diets in the lives of common people by

Glimpses of Technologies displayed in Food Festival

leveraging the established and popular National Street Food Festival.

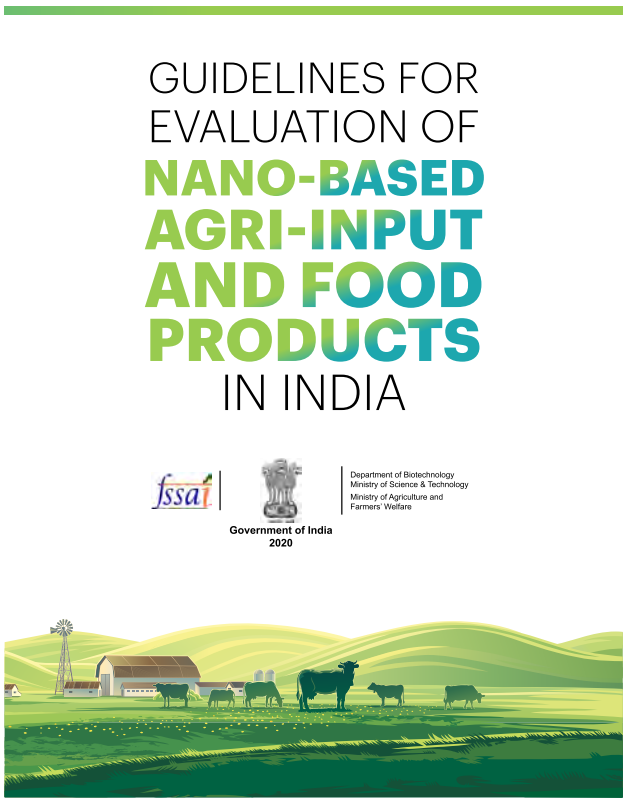
Moreover, on this occasion, the Hon'ble Minister Dr Harshvardhan also launched the"Network for Scientific Co-operation for Food Safety and Applied Nutrition" (NetSCoFAN), a network of research and academic institutions working in the area of food and nutrition. This network comprises eight groups of institutions working in different areas as under (1) Biological Group (BIG); (2) Chemical Group (CHG); (3) Nutrition and Claims Group (NLG); (4) Foods of Animal Origin Group (FAG); (5) Food of Plant Origin Group (FPG); (6) Water and Beverages Group (WBG); (7) Food Testing Group (FTG); and (8) Safer and Sustainable Packaging Group (SPG). Each group is leading by a lead institution and selected partner institution(s) and is responsible for carrying out the activities i.e., conduct horizon-scanning of information/ data on existing and emerging food safety risks and issues in the respective areas; conduct surveys, research work & other related activities; sharing of testing facilities and instrumentation, testing protocols and so on. We are happy to share that CSIR-IITR has been lead institute for chemical group of NetSCoFAN.

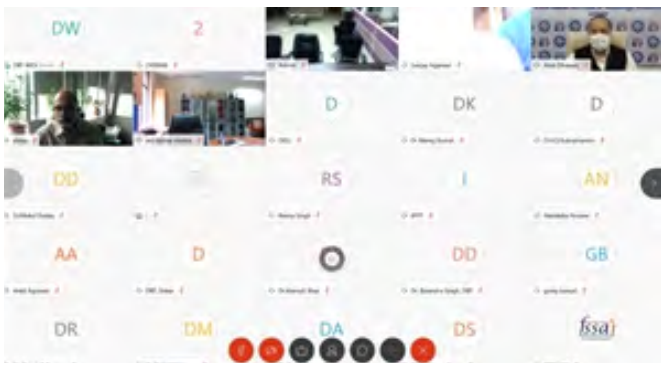
Dr. Harsh Vardhan, Hon'ble Union Minister for Science & Technology and Earth Sciences, Government of India, Visiting the stall of CSIR-IITR

Research for Policy

CSIR-IITR contributed to the formulation of Guidelines for Evaluation of Nano-based agri-input and food products in India

CSIR-IITR contributed to the Guidelines for Evaluation of Nano-based agri-input and food products in India released on 7th July 2020 by Dr Harsh Vardhan, Hon'ble Union Minister for Science & Technology, Earth Sciences, Government of India. This is an inter-ministry effort and the Department of Biotechnology (DBT), Department of Agriculture, cooperation & farmers welfare, Indian Council of Agricultural Research (ICAR), Food Safety and Standards Authority of India (FSSAI), The Energy and Research Institute (TERI) steered the effort along with other departments including Council of Scientific and Industrial Research (CSIR). CSIR-Indian Institute of Toxicology Research (IITR), Lucknow, a constituent laboratory of CSIR has contributed significantly in the area of nanotoxicology as well as food safety. Based on the expertise available, CSIR-IITR was a part of the inter-ministerial expert committee for finalizing Guidelines for Evaluation of Nano-based agri-input and food products in India. Professor Alok Dhawan, Director, CSIR-IITR, represented CSIR in the committee. These guidelines would help policy makers and regulators to frame effective provisions for future novel nano-based products in the agri-input and food sectors of India. These guidelines would be useful to the researchers, manufacturers, importers and other stakeholders involved in research and development of these products. This is yet another step of CSIR-IITR towards enabling innovation and ensuring safer products to market for the benefit of masses.

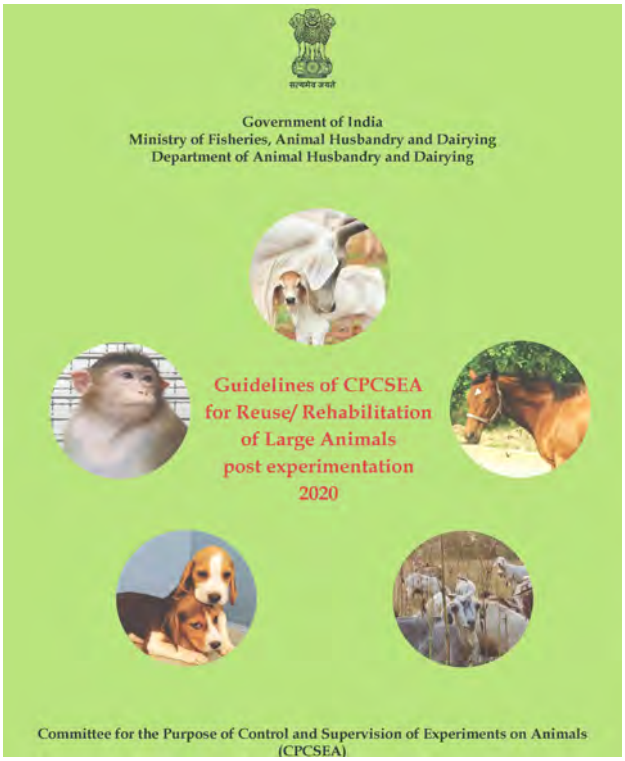




Dr Harsh Vardhan, Hon'ble Union Minister for Science & Technology and Earth Sciences, Government of India, releasing the guidelines through virtual mode on 7th July 2020

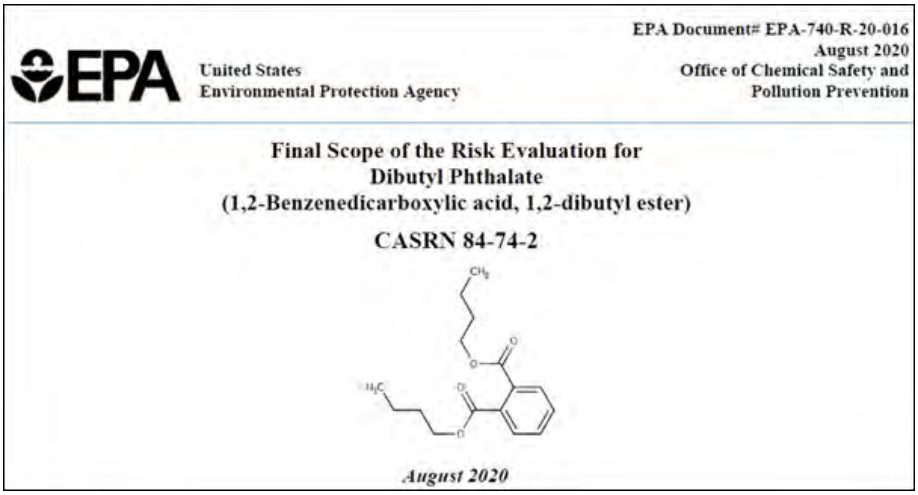
CSIR-IITR contributed to the formulation of Guidelines of CPCSEA for Reuse/Rehabilitation of Large Animals post experimentation

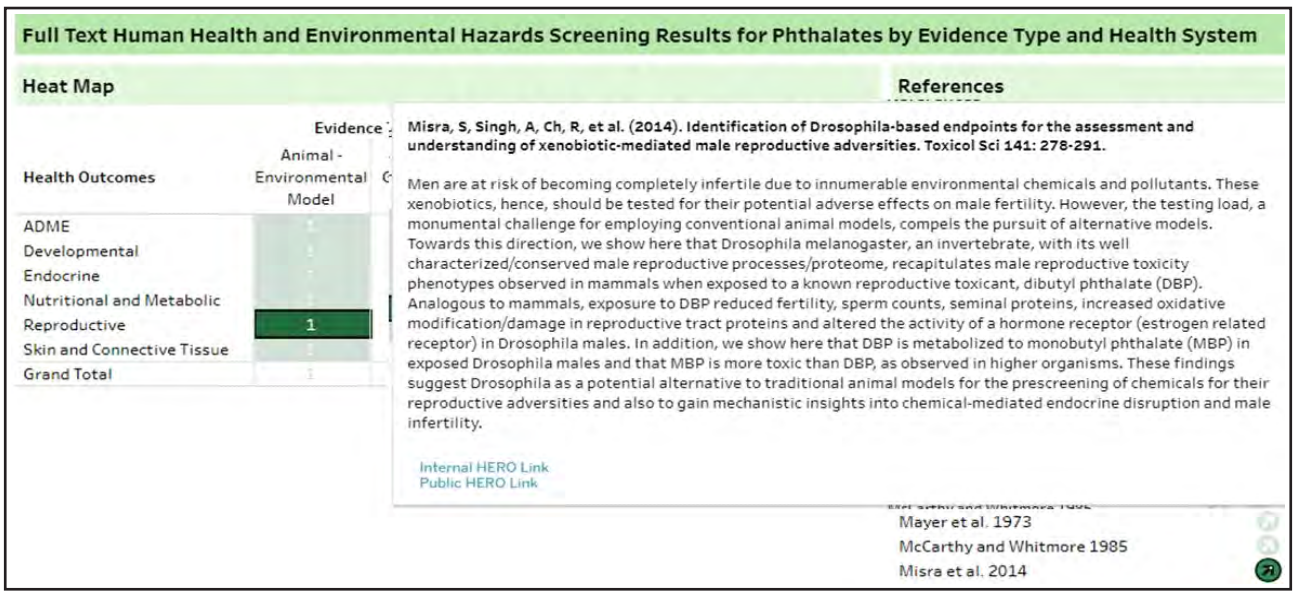
CSIR-IITR contributed to the Guidelines of CPCSEA for reuse/ rehabilitation of large animals post experimentation released in October 2020. This effort was steered by the Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India. These guidelines were prepared by the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCEA) and Professor Alok Dhawan, Director, CSIR-IITR served as the Chairman of the committee. These guidelines have been prepared to operationalize the rules amended in 2006, Section 9 (cc) for Rehab and Reuse of large animals. These guidelines would be useful to the academia, industry and other stakeholders, whose research/manufacturing practices involve animals above the phylogenetic level of rodents and lagomorpha. This is yet another step of CSIR-IITR towards enabling good laboratory practices leading to humane use of animals.



CSIR-IITR work featured in EPA publication

The findings from the CSIR-IITR research publication titled "Identification of Drosophila-based endpoints for the assessment and understanding of xenobiotic-mediated male reproductive adversities (Toxicological Sciences. 2014: 141:278-291. doi: 10.1093/toxsci/ kfu125) by Dr Ravi Ram Kristipati and his group have been included in the US-EPA document (no. EPA-740-R-20-016, August 2020) on "Final Scope of the Risk Evaluation for Dibutyl Phthalate".The study is included under Figure 2.10 of the document that highlights peer-reviewed literature inventory heatmap-human health and environmental hazards search results for dibutyl phthalate. Of the 5939 references on DBP hazards retrieved for full text review by EPA, our Toxicological Sciences study is one of the 596 papers chosen (based on specific criteria such as in vivo studies having appropriate controls, apical biological effects and concurrently measured media/tissue concentrations) for inclusion in the full text part of the above EPA document as an evidence for reproductive health outcomes in Animal-environment model under the component of DBP hazards. The same paper earlier was included in the OECD document (November 2016) on the classification of DBP as a Class 1B reproductive toxicant.




Full Text Human Health and Environmental Hazards Screening Results for Phthalates by Evidence Type and Health System
Heat Map
References
Evidence
Health Outcomes
Animal - Environmental Model
ADME
Developmental
Endocrine
Nutritional and Metabolic
Reproductive
1
Skin and Connective Tissue
Grand Total
Misra, S, Singh, A, Ch, R, et al. (2014). Identification of Drosophila-based endpoints for the assessment and understanding of xenobiotic-mediated male reproductive adversities. Toxicol Sci 141: 278-291.
Men are at risk of becoming completely infertile due to innumerable environmental chemicals and pollutants. These xenobiotics, hence, should be tested for their potential adverse effects on male fertility. However, the testing load, a monumental challenge for employing conventional animal models, compels the pursuit of alternative models. Towards this direction, we show here that Drosophila melanogaster, an invertebrate, with its well characterized/conserved male reproductive processes/proteome, recapitulates male reproductive toxicity phenotypes observed in mammals when exposed to a known reproductive toxicant, dibutyl phthalate (DBP). Analogous to mammals, exposure to DBP reduced fertility, sperm counts, seminal proteins, increased oxidative modification/damage in reproductive tract proteins and altered the activity of a hormone receptor (estrogen related receptor) in Drosophila males. In addition, we show here that DBP is metabolized to monobutyl phthalate (MBP) in exposed Drosophila males and that MBP is more toxic than DBP, as observed in higher organisms. These findings suggest Drosophila as a potential alternative to traditional animal models for the prescreening of chemicals for their reproductive adversities and also to gain mechanistic insights into chemical-mediated endocrine disruption and male infertility.
Internal HERO Link
Public HERO Link
Mayer et al. 1973
McCarthy and Whitmore 1985
Misra et al. 2014

Success story

Collaborative efforts of CSIR-IITR and RIFM for the fragrance industry (CSIR-Industry Action Plan for Sustainable Development)

Essential/fragrance oils have become an integral part of our lives. Their applications are increasing in cosmetics, toiletries, pharmaceuticals, food & beverages, aromatherapy, and even at homes. Therefore, the Essential/Fragrance Oils market share is also expected to grow exponentially. With an increase in the area of aromatic cultivation and up-gradation of technology for its processing, India has enormous export potential for essential oils.

Awareness of the safety of essential oils being used in cosmetics and toiletries is also increasing day by day among the consumers. Therefore, their quality testing, risk/toxicity assessments, etc. essentially need to be carried out before introducing them in the market. Further, standards and regulations also need to be in place to ensure the safety of these products and to stop unethical/false/unsafe/spurious /adulterated essential oils containing products coming to the market.

Keeping in view of the above, the INCITE 2018 conference was held at CSIR-IITR on 15th February 2018. The event was organised jointly by CSIR-Indian Institute of Toxicology Research(CSIR-IITR), CSIR- Central Institute of Medicinal and Aromatic Plants(CSIR-CIMAP), Fragrance &Flavour Development Centre, Research Institute of Fragrance Materials (RIFM), the International Fragrance Association (IFRA), and Ultra International Limited as the main industry partner.

The conference was attended by about 100 participants representing Research Institutes, Academia & Fragrance & Perfume Industry. The main objective of the conference was to discuss various issues such as safety standards pertaining to fragrance materials, standardization of products & implementation of harmonized regulations to take the fragrance industry at par with international standards, and draw a roadmap for a sustainable future of the fragrance industries.

The conference was unique because, for the first time, academia, research institutes,and the fragrance industry came together to share their views on critical issues pertaining to the Indian fragrance industry. The highlight of the conference was the participation of high-level delegations from RIFM & IFRA, who first time attended such a meeting held in India.

Speakers and delegates actively participated in brainstorming sessions and on the existing scenario, challenges & opportunities, regulatory framework, harmonization of safety standards with global standards, continually changing market & customer expectations, use of innovative technologies to produce high-quality fragrance compounds, etc. The participants unanimously agreed that while taking out a leaf from this path-breaking event, all stakeholders should continue further deliberations to articulate a roadmap for the fragrance industry's sustainable growth.

Dignitaries of INCITE-2018

Participants of INCITE-2018

CSIR-IITR and the Research Institute for Fragrance Materials (RIFM), USA-a non-profit scientific organization focused on the safe use of fragrance materials-have agreed to sign a Memorandum of Understanding (MoU). This is an outcome of various meetings with RIFM and CSIR-IITR.RIFM is targeting to test the safety/toxicity of more than 3000 fragrance compounds. RIFM will collaborate with CSIR-IITR on the toxicity profiling of the materials using CSIR-IITR facility and capability. This will enhance more business opportunities for CSIR and enable industrial sustainability in this sector, particularly beneficial for Indian industries.

Professor Alok Dhawan, Director, CSIR-Indian Institute of Toxicology Research and Dr James C. Romine, President, The Research Institute for Fragrance Materials, Inc., NJ, USA exchanging the MoU document

Bureau of Indian Standards (BIS) in association with CSIR - Indian Institute of Integrated Medicine, Jammu (IIIM Jammu) has organized a One Day Seminar on "Creating Awareness on Standardization & Regulation among Fragrance & Essential Oil Industry" on Thursday, 07 March 2019 at India Habitat Centre, New Delhi. This seminar aimed to create awareness on National as well as International Standardization and regulations in the field of essential oils, flavours, and fragrances and also to provide an insight into future developments in the essential oil and fragrance sectors.

In the technical sessions, Professor Alok Dhawan, Director, CSIR-IITR, and Dr James C. Romine, President, RIFM have presented their views and other national and international experts on fragrance materials. Other scientists from CSIR-IITR and RIFM also joined the seminar and had discussions for further collaborations in this direction.

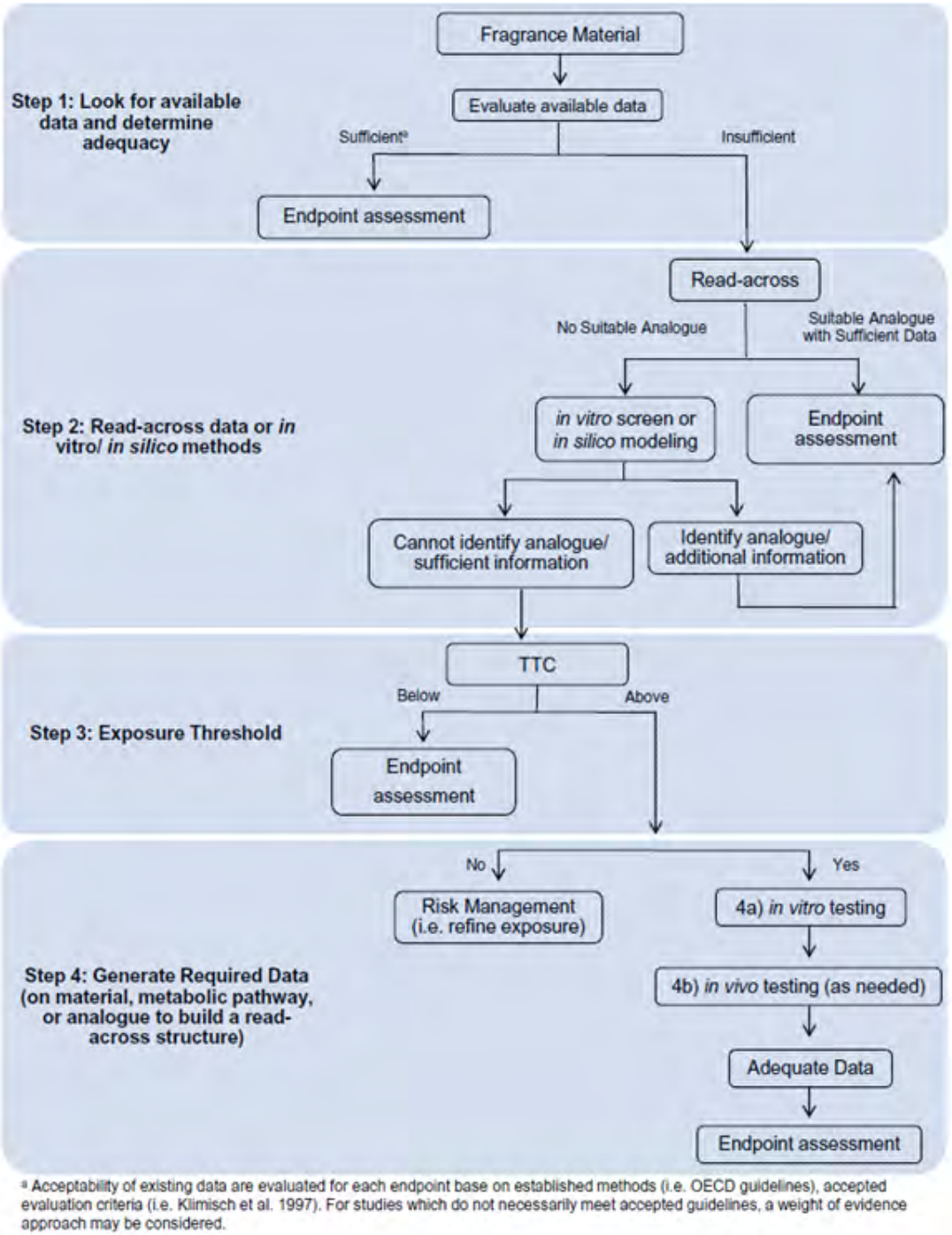
In another RIFM INFOX (INFOrmationeXchange) meeting held on Thursday, January 23, 2020, at New Delhi, experts from RIFM and the Expert Panel for Fragrance Safety had discussions on various aspects of fragrance material safety/toxicity. Following the RIFM INFOX Meeting,Dr Kaushal Joshi from RIFM visited CSIR-IITR on 24th January 2020 in connection with the studies to be

Scientists of CSIR-IITR with
Dr Kaushal Joshi, RIFM (Fourth From Left)

Dr A. B. Pant with Dr Kaushal Joshi

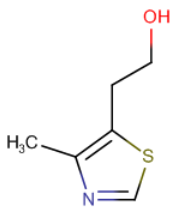
undertaken between CSIR-IITR and RIFM. He met with different endpoint (fragrance safety) scientists at CSIR-IITR to strengthen the collaboration. He was shown the facilities at CSIR-IITR main campus and the Gheru campus, also.

As a follow-up of the MoU between CSIR-IITR and RIFM, CSIR-IITR scientists have participated in the Risk Assessment evaluation exercise (based on the Criteria for the Research Institute for Fragrance Materials, Inc. (RIFM)safety evaluation process for fragrance ingredients (Food and Chemical Toxicology, 2015 Aug;82 Suppl:S1-S19) and completed the risk evaluation of four chemical constituents of fragrance materials. The risk evaluation of 4-methyl-5-thiazoleethanol (CAS Registry Number:137-00-8) is provided below.



Overall process flow chart. (Taken from Criteria for the Research Institute for Fragrance Materials, Inc. (RIFM) safety evaluation process for fragrance ingredients, Food and Chemical Toxicology, 2015 Aug;82 Suppl:S1-S19)

Name: 4-Methyl-5-thiazoleethanol
CAS Registry Number:137-00-8



References: (Api et al., 2020; Api et al., 2015)

I. SUMMARY

1. Human Health Endpoint Summaries:

Genotoxicity:

	Mutagenicity	Clastogenicity
Step 1: Data	Insufficient	Insufficient
Step 2: Read-across		
Step 3: TTC* (1.5 µg/person/day or 0.025 µg/kg/day)		
Step 4: Generate data		

*Kroes, 2004; #44453; ICH, 2013

Based on the current existing data and use levels, 4-methyl-5-thiazoleethanoldoes not present a concern for genotoxic potential.

Risk Assessment:

4-methyl-5-thiazoleethanolwas assessed in the BlueScreen assay and found positive for both cytotoxicity and genotoxicity, without metabolic activation (Birrell, 2013; #65081) and found negative for both cytotoxicity and genotoxicity, with metabolic activation (Birrell, 2013; #65081). The mutagenic activity of 4-methyl-5-thiazoleethanol has been evaluated in a bacterial reverse mutation assay conducted equivalent to OECD TG 471 using the standard plate incorporation method. *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537, and 1strain of *E. coli* (WP2uvrA) were treated with 4-methyl-5-thiazoleethanol in water at concentrations up to 5000 µg/plate. No increases in the mean number of revertant colonies were observed at any tested concentration in the presence or absence of S9 (Dakoulas, 2014; #66715). Under the conditions of the study, 4-methyl-5-thiazoleethanol was not mutagenic in the Ames test.

The clastogenic activity of 4-methyl-5-thiazoleethanol was evaluated in an in vitro micronucleus test conducted in compliance with GLP regulations and in accordance with OECD TG 487. Human peripheral blood lymphocytes were treated with 4-methyl-5-thiazoleethanol in water at concentrations up to 1430 µg/mL in the presence and absence of metabolic activation (S9) for 4 hours and in the absence of metabolic activation for 24 hours. 4-methyl-5-thiazoleethanol did not induce binucleated cells with micronuclei when tested up to the maximum concentration in either the presence or absence of an S9 activation system (Roy, 2014; #67287). Under the conditions of the study, 4-methyl-5-thiazoleethanol was considered to be non-clastogenic in the in vitro micronucleus test.

Based on the available data, 4-methyl-5-thiazoleethanol does not present a concern for genotoxic potential.

Additional References: None

Literature Search and Risk Assessment Completed on: 09/07/19

Repeated Dose Toxicity:

	Repeated Dose Toxicity
Step 1: Data	Insufficient
Step 2: Read-across	Insufficient
Step 3: TTC* (90 µg/person/day or 1.5 µg/kg bw/day)	Below
Step 4: Generate data	
NOAEL	mg/kg/day
MOE	

*Kroes, 2007; #53925

There is no repeated dose toxicity data on 4-methyl-5-thiazoleethanol or any read-across material available. The total systemic exposure to 4-methyl-5-thiazoleethanol is below the TTC for the repeated dose toxicity endpoint of a Cramer Class III material at the current level of use.

Risk Assessment:

There is no repeated dose toxicity data on 4-methyl-5-thiazoleethanol or any read-acrossmaterials that can be used to support the repeated dose toxicity endpoint. The total systemic exposure (0.54 µg/kg/day) is below the TTC for a Crammer Class III material (1.5 µg/kg bw/day; Kroes, 2007;# 53925).

Additional References: Toxtree

Literature Search and Risk Assessment Completed on: 10/06/20

Reproductive Toxicity:

	Developmental Toxicity	Fertility
Step 1: Data	Insufficient	Insufficient
Step 2: Read-across	Insufficient	Insufficient
Step 3: TTC* (90µg/person/day or 1.5 µg/kg bw/day)	Below (0.00054 mg/kg/day or 0.54 µg/kg bw/day)	Below (0.00054 mg/kg/day or0.54 µg/kg bw/day)
Step 4: Generate data		
NOAEL		
MOE		

*Kroes, 2007; #53925

At hand, no reproductive and developmental toxicity data on 4-methyl-5-thiazoleethanol is available, and no read-across material is available. The total systemic exposure to 4-methyl-5-thiazoleethanol is much lower than the threshold for toxicological concern (TTC) value with reference to the reproductive and developmental toxicity endpoint of a Cramer Class III material.

Risk Assessment:

There is no reproductive toxicity or developmental toxicity data on 4-methyl-5-thiazoleethanol available. Read-across literature is also not found that can support the potential of reproductive and developmental toxicity endpoints. The total systemic exposure provided (0.00054 mg/kg/day or 0.54 µg/kg bw/day) is much below the threshold for toxicological concern (TTC) value for a Cramer Class III material (90µg/person/day or 1.5 µg/kg bw/day).

Additional References: Application for the threshold of toxicological concern (TTC) to the safety evaluation of cosmetic ingredients; R. Kroes, A.G.Renwick, V.Feron, C.L.Galli, M.Gibney, H.Greim, R.H.Guy, J.C.Lhuguenot, J.J.M. van de Sandt; Food Chem Toxicol; 2007 Dec;45(12):2533-62

Literature Search and Risk Assessment Completed on: 10/06/20

Skin Sensitization:

	Skin Sensitization
Step 1: Data	Limited
Step 2: Read-across	Insufficient
Step 3: DST	Below
Step 4: Generate data	
NESIL	(Note: if not a sensitizer Not Applicable)

No data are available from ECHA Studies.

Risk Assessment:

The chemical structure of this material indicates that it would not be expected to react with skin proteins (Roberts, 2007b; #53620; Toxtree 2.6.13; OECD Toolbox v4.1).According to the GHS System of Classification, based on the information available for 4-methyl-5-thiazoleethanol, it is classified as an irritant. It has been reported to cause skin corrosion/irritation, severeeye irritation/eye damage. It has also been reported to cause specific target organ toxicity in the lungs resulting in respiratory tract irritation. It is advised to only handle the chemical outdoors or in a well-ventilated area after wearing protective gloves, clothes, and face/eye protection.

Acting conservatively, due to the limited data, the reported exposure was benchmarked utilizing the non-reactive DST of 900 µg/cm2 (Safford, 2015b; #68679). The current exposure from the 95th percentile concentrationis below

Table 1. Maximum acceptable concentrations for 4-methyl-5-thiazoleethanol that present no appreciable risk for skin sensitization based on non-reactive DST.

IFRA Category[a]	Description of Product Type	Maximum Acceptable Concentrations in Finished Products Based on Non-reactive DST	Reported 95th Percentile Use Concentrations in Finished Products
1	Products applied to the lips	0.069%	0.0014%
2	Products applied to the axillae	0.021%	0.0044%
3	Products applied to the face using fingertips	0.41%	9.1×10^{-4}%
4	Fine fragrance products	0.39%	0.014%
5	Products applied to the face and body using the hands (palms), primarily leave-on	0.10%	0.011%
6	Products with oral and lip exposure	0.23%	0.0096%
7	Products applied to the hair with some hand contact	0.79%	0.0016%
8	Products with significant ano-genital exposure	0.041%	No Data[c]
9	Products with body and hand exposure, primarily rinse-off	0.75%	0.0050%
10	Household care products with mostly hand contact	2.7%	0.022%
11	Products with intended skin contact but minimal transfer of fragrance to skin from inert substrate	1.5%	No Data[c]
12	Products not intended for direct skin contact, minimal or insignificant transfer to skin	Not Restricted	0.56%

Note: [a]For a description of the categories, refer to the IFRA/RIFM Information Booklet.

[b]No reported use

[c]Fragrance exposure from these products is very low. These products are not currently in the Creme RIFM Aggregate Exposure Model.

the DST for non-reactive materials when evaluated in all QRA categories. Table 1 provides the maximum acceptable concentrations for 4-methyl-5-thiazoleethanol that present no appreciable risk for skin sensitization based on the non-reactive DST. These levels represent maximum acceptable concentrations based on the DST approach. However, additional studies may show it could be used at higher levels.

Additional References:

https://pubchem.ncbi.nlm.nih.gov/compound/5-%282-hydroxyethyl%29-4-methyl-thiazole

Literature Search and Risk Assessment Completed on:25 Aug 2020.

Phototoxicity/Photoallergenicity:

	Phototoxicity	Photoallergenicity
Step 1: UV benchmark (1000 L · mol^{-1} · cm^{-1})	Below	
Step 2: Study data		
Step 3: Exposure benchmark		
Step 4: Read-across		
Step 5: Generate data		

Based on the UV/Vis spectra only, phototoxicity or photoallergenicity of 4-Methyl-5-thiazoleethanol cannot be tested predicted

Risk Assessment:

There are no phototoxicity studies available for 4-methyl-5-thiazoleethanol in experimental models. UV/Vis absorption spectra indicate minor absorbance between 290 and 700 nm. The corresponding molar absorption coefficient is below the benchmark of concern for phototoxicity and photoallergenicity. Based on the lack of significant absorbance in the critical range, 4-methyl-5-thiazoleethanol does not present a concern for phototoxicity or photoallergenicity.

UV Spectra Analysis:

UV/Vis absorption spectra indicate minor absorbance in the range of 290-700 nm. The molar absorption coefficient is below the benchmark of concern for phototoxic effects, 1000 L ? mol-1 ? cm-1.

Additional References: None

Literature Search and Risk Assessment Completed On: 22-06-20.

Local Respiratory Toxicity:

	Local Respiratory Toxicity
Step 1: Data	No Data
Step 2: *In vitro*/*in silico*/read-across	No Data
Step 3: TTC* (0.47mg/person/day or 0.008 mg/kg bw/day)	Below
Step 4: Generate data	
NOAEC	
MOE	

*Carthew, 2009; #57336

The MOE could not be calculated due to a lack of appropriate data. The exposure level for 4-methyl-5-thiazoleethanol is below the Cramer Class III TTC value for inhalation exposure local effects.

Risk Assessment:

There are no inhalation data available on 4-methyl-5-thiazoleethanol. Based on the Creme RIFM Model, the inhalation exposure is 0.011 mg/day. This exposure is 43 times lower than the Cramer Class IIITTC value of 0.47mg/day (based on human lung weight of 650 g;Carthew, 2009; #57336); therefore, the exposure at the current level of use is deemed safe.

Additional References:None

Literature Search and Risk Assessment Completed On: 08/08/20

References:

Api, A. M., Belsito, D., Botelho, D., Bruze, M., Burton, G. A., Jr., Buschmann, J., . . . Tsang, S. (2020). RIFM fragrance ingredient safety assessment, 4-methyl-5-thiazoleethanol, CAS Registry Number 137-00-8. *Food Chem Toxicol, 144 Suppl 1,* 111530. doi:10.1016/j.fct.2020.111530

Api, A. M., Belsito, D., Bruze, M., Cadby, P., Calow, P., Dagli, M. L., . . . Wilcox, D. K. (2015). Criteria for the Research Institute for Fragrance Materials, Inc. (RIFM) safety evaluation process for fragrance ingredients. *Food Chem Toxicol, 82 Suppl,* S1-S19. doi:10.1016/j.fct. 2014. 11.014

Future directions:

- Generation of safety data from the Indian context for different fragrance compounds.
- Setting up safety standards and evaluation of fragrance compound toxicology profiling.
- Collaborative efforts of CSIR-IITR with RIFM for Indian fragrance industries.

CSIR-IITR Scientists involved in the study

CSIR-IITR Scientists	End points
 Dr Alok K Pandey	Genotoxicity
 Dr Akshay Dwarakanath	Repeated Dose Toxicity Skin Sensitization
 Dr Jyotsna Singh	Local Respiratory Toxicity
 Dr Ratan Singh Ray	Phototoxicity/Photoallergenicity
 Dr Dhirendra Singh	Reproductive Toxicity Skin Sensitization
 Dr Ramkrishnan Parthasarathi	*In silico* Toxicity

Research Institute for Fragrance Materials (RIFM)

Established in 1966, the Research Institute for Fragrance Materials (RIFM) generates, analyzes, evaluates, and distributes data to provide a scientific basis for the safe use of fragrances. RIFM has compiled the most comprehensive, worldwide source of toxicology data, literature, and general information on fragrance and flavor raw materials. RIFM's fragrance ingredient Safety Assessment program draws from its comprehensive database of over 70,000 references and more than 135,000 human health and environmental studies.

All of RIFM's findings are reviewed and approved by the Expert Panel for Fragrance Safety, an independent, international team of researchers and academics with no ties to the fragrance industry. The Expert Panel reviews and approves RIFM's work before RIFM submits it for peer-reviewed publication in a reputable scientific journal. The Expert Panel's conclusions form the basis for the Standards set by the International Fragrance Association (IFRA).

Official RIFM website: https://www.rifm.org/#gsc.tab=0

Fragrance Material Assessment Resource Center: http://fragrancematerialsafetyresource.elsevier.com/

Expert Panel for Fragrance Safety: http://fragrancesafetypanel.org/

Scientific Social Responsibility of CSIR-IITR on COVID-19 Prevention

CSIR-IITR has produced 4500 Litres of WHO formulated hand sanitizer and distributed to over 30000 personnel involved in essential services to provide them first line of protection for their safety that include Ration Shop, Public Distribution System, LPG bottling plant, Central Government Health Scheme (CSHS), Electricity Supply Administration & Electricity Substations, State Mission for Clean Ganga (SMCG), Lucknow Nagar Nigam, Police department, CPRF, Helping Hands -Organization helping Cancer Children, District hospital, Raibarely through the district administration and King George's Medical University (KGMU).

This initiative was part of the Scientific Social Responsibility of CSIR-IITR and was accomplished through the Corporate Social Responsibility contributions of various organisations as part of CSIR Vertical 4: Hospital Assistive Devices and PPEs.

Further, M/s ASPL Green Ventures (P) Ltd, a startup of Lucknow has been incubated at CSIR-IITR BIRAC-BioNEST centre for the preparation of hand sanitizer and developing disinfection solutions. Microwave based disinfection machine for disinfection of PPE and N-95 mask was developed by SSMaser Technology Pvt Ltd, former incubatee of the institute. The sterilization cycles for disinfection were co-developed with the help of CSIR-IITR.

CSIR-IITR has produced 4500 litres of WHO formulated hand sanitizer as a part of scientific social responsibility. The sanitizers were provided to Chief Minister, Yogi Adityanath and Chief Secretary for distribution to various agencies.

• 26 मार्च 2020

हिन्दुस्तान

आईआईटीआर के निदेशक ने मंडलायुक्त को सैनिटाजर सौंपा।

आईआईटीआर ने 350 लीटर सैनिटाइजर बनाया

लखनऊ। आईआईटीआर ने कोरोना वायरस से जरूरी सेवाओं में लगे कर्मचारियों के बचाव के लिए बुधवार को 350 लीटर सैनिटाइजर का निर्माण करके मण्डलायुक्त मुकेश मेश्राम को सौंप दिया है। गुरुवार को 150 लीटर सैनिटाइजर और सौंप दिया जाएगा। निदेशक प्रो. आलोक धवन ने बताया कि संस्थान के प्रधान वैज्ञानिक डॉ. आर. पार्थसारथी के नेतृत्व में रिसर्च स्कालर सुष्मिता तिवारी, अंशिका गुप्ता, मिताली सिन्हा, अभिषेक मिश्रा व अंकित कुमार ने दिनरात परिश्रम कर यह सैनिटाइजर बनाया है।

CSIR-Indian Institute of Toxicology Research (CSIR-IITR) prepared hand-rub sanitizer and presented to Smt Anandiben Patel, Hon'ble Governor of Uttar Pradesh on April 11, 2020.

CSIR-Indian Institute of Toxicology Research (CSIR-IITR) prepared hand-rub sanitizer and provided it to Shri Suresh Kumar Khanna, Cabinet Minister for Finance, Parliamentary Affairs and Medical Education Departments, Government of Uttar Pradesh on April 11, 2020.

Media coverage regarding the distribution of hand sanitizer prepared by CSIR-IITR

Contributions of CSIR-Indian Institute of Toxicology Research, Lucknow in the fight against COVID-19

Severe Acute Distress Respiratory Syndrome Novel Coronavirus (SARS-CoV-2) infection has been declared a pandemic by WHO in January 2020. The outbreak created havoc across the globe. Currently, there are no proven anti-viral drugs for COVID-19, and no vaccines are available to prevent infection with SARS–CoV-2. Hence, social distancing and wearing masks is the only efficient means to prevent the community spread of the COVID-19.

Adopting a multipronged strategy, CSIR set up five technology verticals to address the multifarious problems of the corona pandemic. These verticals cover different disciplines across the CSIR Laboratories and draw the strength of scientists, technical staff and students to fight COVID-19. Besides, CSIR is also working on promoting rural employment, providing ready to eat food and other outreach programs.

A brief account of progress made so far by CSIR-IITR under these verticals is given below:

Source: https://covid19csir.urdip.res.in/

Contributions of CSIR-IITR in fight against COVID-19 pandemic

COVID-19 Testing Facility at CSIR-IITR

The Real-Time-PCR based quantitative assay using nasal and pharyngeal specimens is considered a gold standard for the diagnosis of COVID-19. Initially, the medical institutions were employed to screen the suspected cases of COVID-19, but the requirement of screening was many-fold higher than that of their capacity and resources. At that stage in national crises, CSIR institutes including CSIR-IITR offered their services to increase capacity for testing SARS–CoV-2 infection pan India as part of Vertical 2: Rapid and Economical Diagnosis. The institute developed state of the art RT-PCR based COVID-19 testing facility within the campus. The facility is equipped to ensure BSL2+ level safety, quality control and quality assurance, efficacy, and real-time data reporting. Few of the senior scientists received biosafety, data management and virus handling training from the Department of Microbiology, KGMU, Lucknow, and subsequently, they trained their team members at CSIR-IITR, Lucknow. A squad of extremely skilled and devoted scientists, expert staff, and research fellows are continuously working seven days a week to run the testing facility to the broadest extent. CSIR-IITR is receiving samples from different districts of Uttar Pradesh as per the need of the districts. CSIR-IITR has covered districts of Ambedkar Nagar, Amethi, Ayodhya, Banda, Gonda, Lucknow, Raebareli, Saharanpur, Sultanpur, Siddhartha Nagar and Unnao. Since May 4, 2020, CSIR-IITR has tested more than 1.15 lakhs samples by October 20, 2020. CSIR-IITR is the first CSIR laboratory to reach this milestone. More than one-fourth of the total tests of COVID-19 using Real-Time-PCR based quantitative assay done at CSIR labs nationwide have been performed at CSIR-IITR itself. The Department of Biotechnology, Government of India formed clusters of central government laboratories pan India. For the Lucknow cluster (CSIR-CDRI, CSIR-NBRI, DST-BSIP and CSIR-IITR), CSIR-IITR was made the nodal lab. Along with diagnostic services, CSIR-IITR is also working as a resource centre to impart the hands-on training in the methods of corona testing and Biosafety measures to be taken, to the personnel from other institutes for their capacity building for corona testing.

COVID-19 testing facility at CSIR-IITR

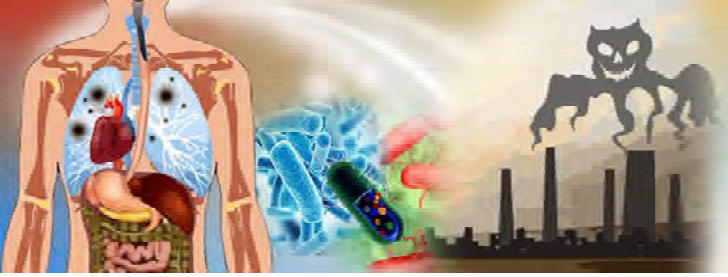
CSIR-IITR have tested over 1,00,000 samples and became the first CSIR lab to reach this milestone.

Research Highlights

Mission & Vision

CSIR-IITR, a leader in toxicology research, endeavors to mitigate problems of human health and environment. The institute aims to accomplish its goals through the following objectives:

- Safety evaluation of chemicals used in industry, agriculture and everyday life.
- Mode of action of toxic chemicals/pollutants.
- Remedial/preventive measures to safeguard health and environment from pollutants.
- Occupational health hazards due to exposure in chemicals industries, mines, agricultural fields and environment.
- Simple/rapid diagnostic tests for disorders caused by industrial and environmental chemicals
- Collect, store and disseminate information on toxic chemicals.
- Human resource development for dealing with industrial and environmental problems.
- Provide a platform to public and entrepreneurs to address queries and concerns regarding safety/toxicity of chemicals, additives and products.



Environmental Toxicology

Dr N. Manickam
Area Coordinator

Environmental Toxicology group at CSIR-IITR undertakes studies to improve environmentally linked human health employing basic and translational research endeavors. Model organisms used for toxicity evaluations such as *Drosophila melanogaster, Eisenia fetida, Caenorhabditis elegans* and other models are compatible for the risk assessment of varieties of toxicants. The research outcome helps in assessment of the chemical exposure and identification of susceptibility biomarkers, environmental genomics, microbial metagenomics gene-environment interaction, environmental health, reproductive biology, mutagenesis, waste treatment and bioremediation. The need for high-throughput toxicity assays coupled with ethical concerns over animal testing necessitated the pursuit of better tools for ecotoxicological studies. Hence, the development, validation and application of high throughput alternate models as well as alternative to animal models for ecotoxicity studies are high priority in ecotoxicology. The information on usage, exposure and effects obtained from quantitative structure–activity relationships, read-across methods, thresholds of toxicological concern and *in vitro* tests prior to *in vivo* testing are ideal routes for more rapid, efficient and cost effective risk assessment of chemicals. A major challenge is the development of diagnostic capabilities to precisely determine the cause–effect relationships within impaired ecosystems. This will help in determining the extent to which existing remediation strategies/technologies are effective and the refinements needed in risk management.

Keeping these issues in view, the environmental toxicology group at IITR aims to generate knowledge/tools useful for protection as well as management of ecosystem integrity and to advance the understanding of ecotoxicological problems across different ecological strata at cellular, genetic and organismal levels in order to improve environmentally relevant ecological risk assessment and to mitigate environmental pollutants.

Major research domains under Environmental Toxicology area are,

- Mechanism of toxicity of environmental pollutants
- Remediation of hazardous and persistent chemical substances from soil, water and industrial wastes
- Ecotoxicity and Environmental Monitoring

High sucrose diet induces morphological, structural and functional impairments in the renal tubules of *Drosophila melanogaster:* A model for studying type-2 diabetes mediated renal tubular dysfunction

Continuous feeding of high dietary sugar is strongly associated with type 2 diabetes (T2D) and its secondary complications. Diabetic nephropathy (DN) is a major secondary complication that leads to glomerular and renal tubular dysfunction. The study aimed to investigate the effects of chronic exposure of high sugar diet (HSD) on renal tubules. Malpighian tubules (MTs), a renal organ of *Drosophila*, were used as a model in the study. Feeding of HSD develops T2D condition in *Drosophila*. The MTs showed structural abnormalities in 20 days of HSD fed flies. Impaired insulin signaling, oxidative stress, enhanced levels of advanced glycation end-product (AGE), receptor for AGE (RAGE) and induction of apoptosis were observed in the MTs of these flies. Further, altered expression of transporters, enhanced uric acid level and reduced fluid secretion rate confirmed the impaired function of MTs in these flies. RNA-seq and RT-PCR analyses in the MTs of HSD fed-and control-flies revealed the altered expression of candidate genes associated with several important pathways including Extra cellular matrix (ECM), AGE-RAGE, TGF-β, galactose, starch and sucrose metabolism that are well known mediators of renal tubular dysfunction in diabetic nephropathy (DN) patients. Disruption of insulin signaling in the MTs also caused renal tubular dysfunction similar to HSD fed flies. Overall, the study suggested that phenotypes observed in the MTs of HSD fed flies recapitulate several hallmarks of renal tubular dysfunction in DN patients. Therefore, it was concluded that MTs of HSD fed flies may be used for deciphering the underlying mechanisms of T2D mediated renal tubular dysfunction.

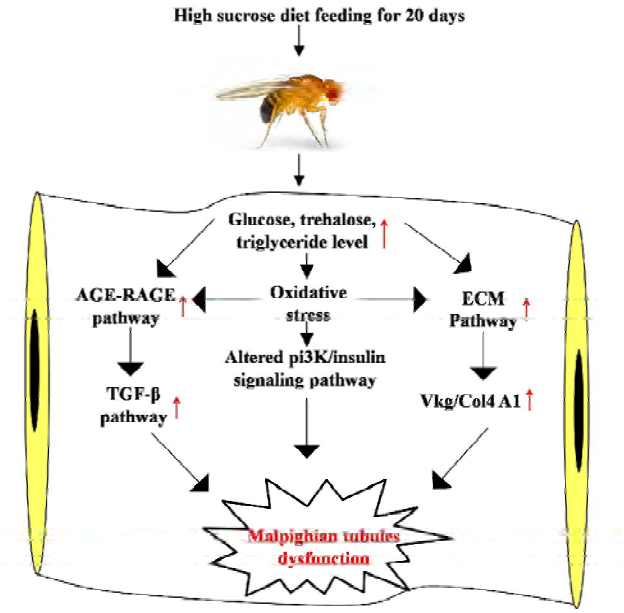
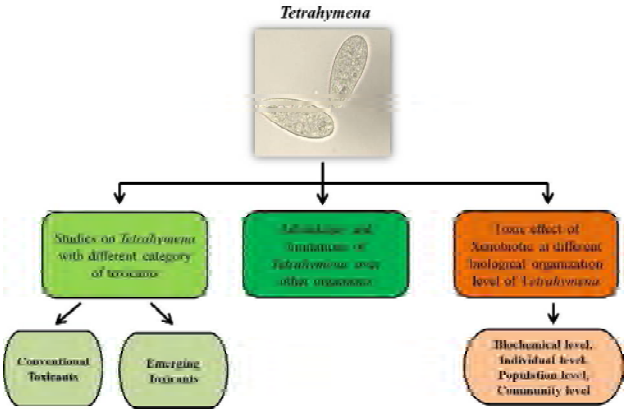


Illustration of high sucrose diet induced effects on the renal tubules of Drosophila

Rani L, Saini S, Shukla N, Chowdhuri DK, Gautam NK (2020) Insect Biochemistry and Molecular Biology, doi.org/10.1016/j.ibmb.2020.103441.

Importance of protozoa *Tetrahymena* in toxicological studies: A review

Tetrahymena is a single-cell eukaryotic organism present in all aquatic environments and can easily be maintained in laboratory conditions in a cost-effective manner. The review gives a brief description of the physiology of *Tetrahymena*, culture handling, and maintenance of Tetrahymena species. This review article is focused on various toxicological bioassays at different biological organizational (biochemical, individual, population, and community) levels. Furthermore, some techniques such as single cell gel electrophoresis (SCGE) and microcalorimetry assay are also available to investigate the effect of xenobiotics on the integrity of DNA and metabolic state of Tetrahymena species respectively. The article also discussed how the general physiology, behavioural activities and different organelles of Tetrahymena could be useful in toxicological studies. The strength and limitations of Tetrahymena over other model organisms are also discussed. This article provided suggestions to overcome some problems related to toxicity assessment. Various aspects associated with variability in results, toxicity endpoints, characteristics of organisms and responses against xenobiotic substances (old and new emerging toxicants) were considered.

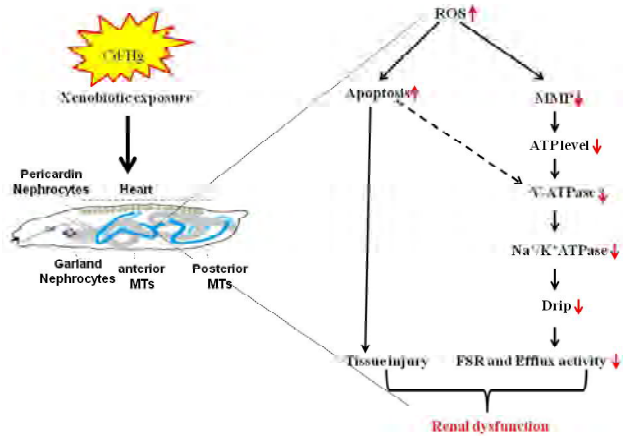


Importance of protozoa Tetrahymena in toxicological assessment

Maurya R, Pandey AK (2020) Science of The Total Environment, 741: 140058

Development of a *Drosophila melanogaster* based model for the assessment of cadmium and mercury mediated renal tubular toxicity

Xenobiotic mediated renal toxicity is one of the major health concerns to the organisms, including humans. New chemicals with nephrotoxic potential are continuously being added to the list of existing nephrotoxicants. To predict the nephrotoxicity of these new chemicals, reliable and cost-effective alternative animal models are required. It is a prerequisite for the identification and assessment of these compounds as potential nephrotoxicants to prevent renal toxicity in the exposed population. *Drosophila melanogaster*, a genetically tractable invertebrate animal model, has a renal system functionally analogous to humans. The Malpighian tubules (MTs) of *D. melanogaster* are similar to the tubular part of nephron of the human kidney. Besides, it recapitulates the renal toxicity hallmark with mammals when exposed to known nephrotoxicants. In this study, first instar larvae of *D. melanogaster* (Oregon R) were exposed to diûerent concentrations of two well-known nephrotoxicants, cadmium (Cd) and mercury (Hg). Akin to higher organisms, Cd and Hg exposure to *D. melanogaster* produce similar phenotypes. MTs of exposed *D. melanogaster* larvae



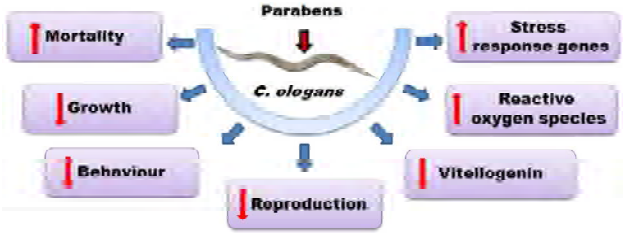
Diagramatic representation of signalling events involved during Cd/Hg induced renal tubuler toxicity in *D. melanogaster*

exhibited increased oxidative stress, activated cellular antioxidant defense mechanism, GSH depletion, increased cleaved caspase-3 expression, increased DEVDase activity and increased cell death. The functional status of MTs was assessed by fluid secretion rate (FSR), eflux activity of transporter protein, mitochondrial membrane potential (MMP), ATP level and expression of junctional protein (Dlg). All the phenotypes observed in MTs of *D. melanogaster* larvae recapitulate the phenotypes observed in higher organisms. Increased uric acid level, the hallmark of renal dysfunction, was also observed in exposed larvae. Taken together, the study suggested that MTs of *D. melanogaster* may be used as a functional model to evaluate xenobiotic mediated nephrotoxicity.

Saini S, Rani L, Shukla N, Banerjee M, Chowdhuri DK, Gautam NK (2020) Ecotoxicology and Environmental Safety, 201: 110811

Toxicity assessment of parabens in *Caenorhabditis elegans*

Parabens, the alkyl esters of *p*-hydroxybenzoic acid such as methylparaben (MeP), ethylparaben (EtP), propylparaben (PrP), butylparaben (BuP) are used as a preservative in food, personal care products (PCPs), and pharmaceuticals, due to their antimicrobial properties. Parabens are continuously released into the environment, during washout of PCPs,



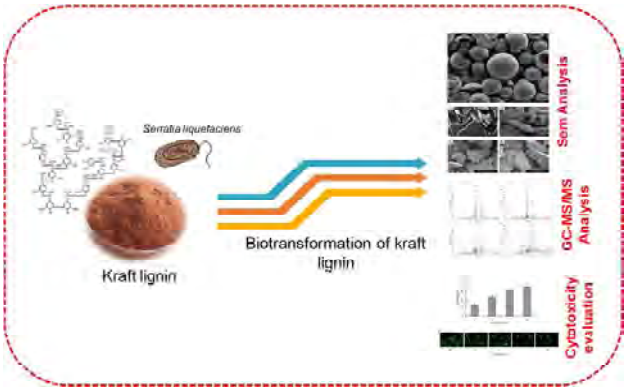
Graphical representation of effects of parabens in the *C. elegans* model

disposal of industrial waste from the pharmaceutical and paper industries. Parabens have been detected in the indoor dust, wastewater stream, surface water of rivers, and the marine system. Recent eco-toxicological data and the environmental presence of parabens, has raised concerns regarding the safety and health of environment/humans. Thus, to further understand the toxicity of parabens, a study was carried out in the soil nematode and a well established biological model organism, *Caenorhabditis elegans*. In this study, LC_{50} of MeP, EtP, PrP and BuP for 72 h exposure from L1 larva to adult stage was found to be 278.1, 217.8, 169.2, and 131.88 µg/ml, respectively. Further exposure to 1/5th of LC_{50} of parabens yielded an internal concentration ranging from 1.67 to 2.83 µg/g dry weight of the organism. The toxicity of parabens on the survival, growth, behavior, and reproduction of the *C. elegans* was found in the order of BuP>PrP>EtP>MeP. Worms exposed to parabens showed significant down-regulation of vitellogenin genes, high levels of reactive oxygen species and anti-oxidant transcripts, the latter being concordant with nuclear localization of DAF-16 and up-regulation of HSF-1 and SKN-1/Nrf. Hence, parabens caused endocrine disruption, oxidative stress and toxicity in *C. elegans* at environment relevant concentration of parabens.

Nagar Y, Thakur RS, Parveen T, Patel DK, Ravi Ram K, Satish A (2020) Chemosphere 246: 125730

Biotransformation and cytotoxicity evaluation of kraft lignin degraded by ligninolytic *Serratia liquefaciens*

Various chemical compounds emerged including kraft lignin (KL) during the processes of papermaking. These chemical compounds in effluent of the paper industry have hazardous environmental impacts. KL is liable for causing pollution of aquatic and water bodies; hence, it must be minimized in order to maintain a healthy and sustainable environment. In the present study, KL degradation was performed with ligninolytic bacterium *Serratia liquefaciens* and authors confirmed biotransformation of KL to various less polluted or harmless compounds. KL being degraded as 1000 mg/L concentration with incubating 30°C for 72, 168, and 240 h, shaking at 120 rpm under laboratory conditions. Authors found 65% maximum degradation of KL and 62% decolorization by the treatment with *S. liquefaciens* for 240 h (10 days). After the treatment of KL, clear changes were observed in its morphology (using scanning electron microscopy and stereo microscopy), hydrodynamic size (using dynamic light scattering), and the functional groups [using Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR–FTIR)]. Biotransformation of KL, monitored by Gas Chromatography–Mass Spectrometry (GC–MS), revealed formation of various metabolites. In addition to degradation of KL, detoxification (involving biotransformation into various metabolites) was assessed through cytotoxicity assays [MTT and calcein-acetoxymethyl (AM) assays] in a human kidney cell line



Biotransformation of Kraft Lignin by *Serratia liquefaciens* and it's Characterization

(NRK-52E), which indicated improved cell survival rates (74% for the bacteria-treated KL solution treated for 240 h) compared to the control (27%). Thus, the study suggested that bacteria *S. liquefaciens* might be useful in reducing the pollution of KL by transforming it into various metabolites with reduced cytotoxicity.

Singh AK, Yadav P, Bharagava RN, Saratale GD, Raj A (2019). Frontier in Microbiology. doi.org/10.3389/fmicb.2019.0236.

Rhamnolipids from *Planococcus* spp. and their mechanism of action against pathogenic bacteria

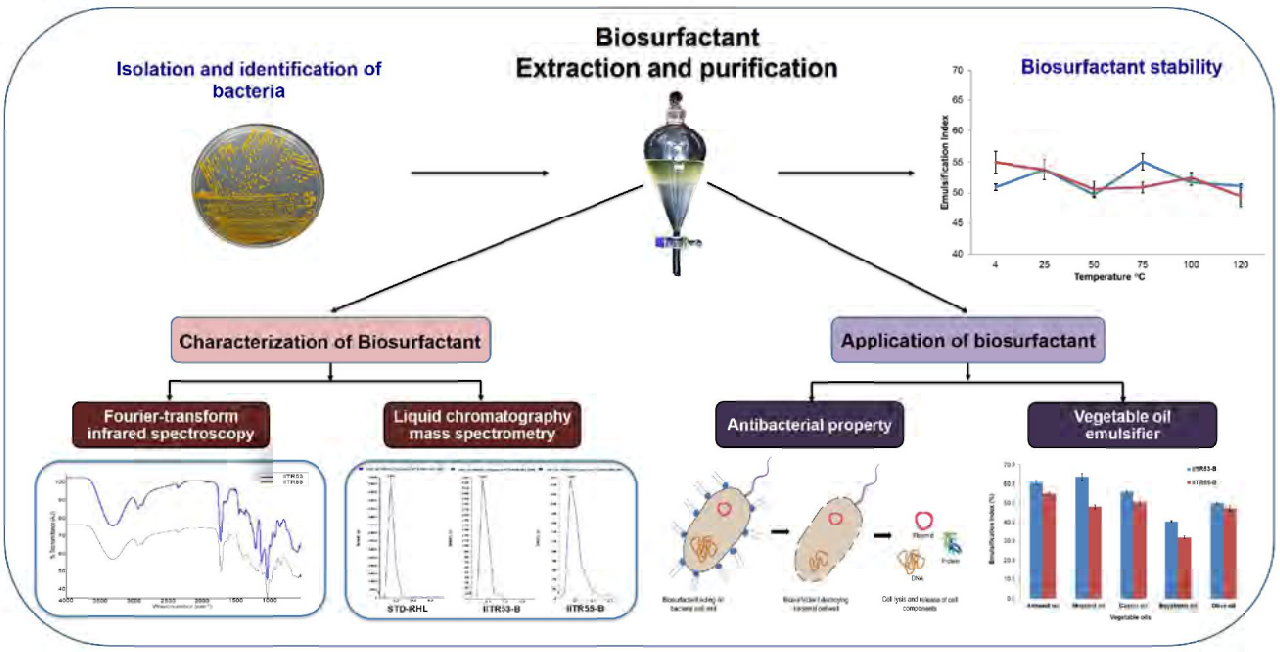
Two bacterial species with the ability to produce biosurfactants were isolated from a pesticide contaminated soil and identified as *Planococcus rifietoensis* IITR53 and *Planococcus halotolerans* IITR55. Formation of froth indicating the surfactant production was observed when grown in basal salt medium containing 2% glucose. The culture supernatant after 72 h showed reduction in surface tension from 72 N/m to 46 and 42 N/m for strain IITR53 and IITR55 with emulsification index of 51 and 54% respectively. The biosurfactant identified as rhamnolipid based on liquid chromatography-mass spectrometry analysis, was found to inhibit the growth of both gram- positive and negative pathogenic bacteria. Both the rhamnolipids at 40 mg/mL exhibited the release of extracellular DNA and protein content. Also at one third of the minimum inhibitory concentration (MIC), a significant generation of reactive oxygen species was recorded. These rhamnolipids effectively emulsified different vegetable oils suggesting their possible utilization as antimicrobial agent.

Gaur VK, Tripathi V, Gupta P, Dhiman N, Regar RK, Gautam K, Srivastava JK, Patnaik S, Patel DK, Manickam N (2020). Bioresource Technology, 307: 123206.

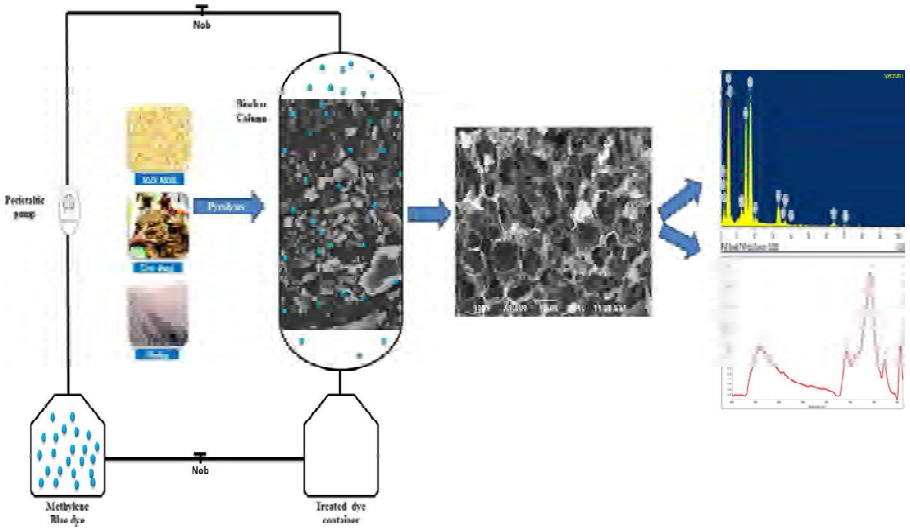
Removal of methylene blue dye using rice husk, cow dung and sludge biochar: Characterization, application and kinetic studies

The study aimed for the removal of Methylene blue (MB) dye using the rice husk biochar (RHB), cow dung biochar (CDB) and domestic sludge biochar (SB) synthesized through slow pyrolysis at 500°C. The biochar was used for the adsorption of synthetic aqueous MB dye. The removal efficiencies of MB by CDB, RHB and SB in a batch experiment were 97.0–99.0; 71.0–99.0 and 73.0–98.9% at conditions, pH (2.0–11.0); Biochar dosage (0.5–6.0 g/100 mL) for 5 days. Adsorption isotherm of Langmuir constant (K_L) were obtained 0.101, 0.583 and 0.128 for RHB, CDB and SB respectively. Further, adsorption kinetics of pseudo first order for RHB, CDB and SB were 0.068, 0.018, and 0.066 while it was 0.031, 0.023 and 0.273 for pseudo second order kinetics. Thus, CDB was more effective adsorbent for the dye removal.

Ahmad A, Khan N, Giri BS, Chowdhary P, Chaturvedi P. (2020) Bioresource Technology, 306: 123202



Graphical representation of characterization & applications of biosurfactant

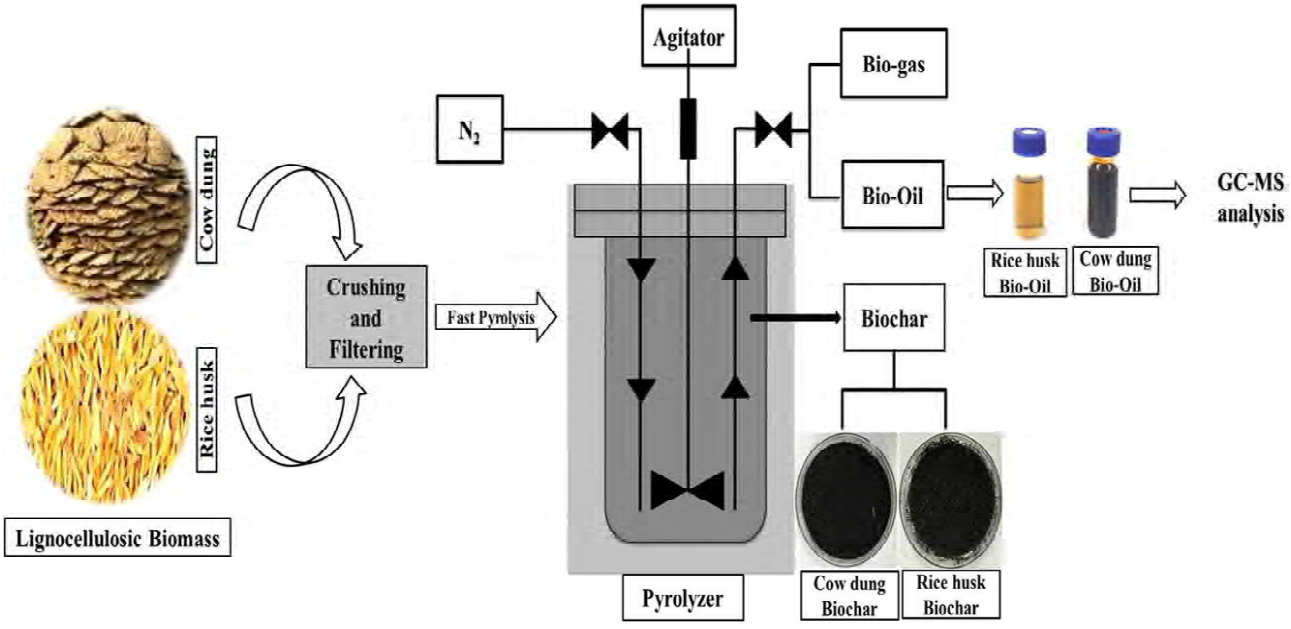


Biochar production, Characterization & applications

Hydrothermal liquefaction of rice husk and cow dung in mixed-bed-rotating pyrolyzer and application of biochar for dye removal

This work studied the hydrothermal liquefaction of rice husk (RH) and cow dung (CD) for the production of biochar and subsequent use of that biochar for the removal of dye from textile industry effluent. These biomasses were subjected to fast pyrolysis (500°C), which yielded biochar (22.8 and 29.8%) and bio-oil (60.4 and 57.3%) from RH and CD, respectively. Biochar was characterized based on spectroscopy Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscope (SEM) and SEM-EDS. Further, bio-oil samples were characterized by GC–MS into saturated and polyunsaturated fatty acids, carboxylic acids, phenolics and aromatic hydrocarbons. The removal efficiencies of the Congo red dye from prepared biochar in a batch experiment were 66.8–96.9% (RH) and 68.9–98.8% (CD). The adsorption isotherms for Langmuir (R^2 = 0.977 and 0.902) and Freundlich (R^2 0.842 and 0.883) were calculated for RH and CD biochar, respectively.

Khan N, Chowdhary P, Ahmad A, Giri BS, Chaturvedi P. (2020) Bioresource Technology, 309:123294.



Hydrothermal liquefaction of rice husk and cow dung in Mixed Bed Rotating pyrolyzer

सी एस आई आर
CSIR
आईआईटीआर
As
Cd
N
OH
Pb
Hg

Food Drug and Chemical Toxicology

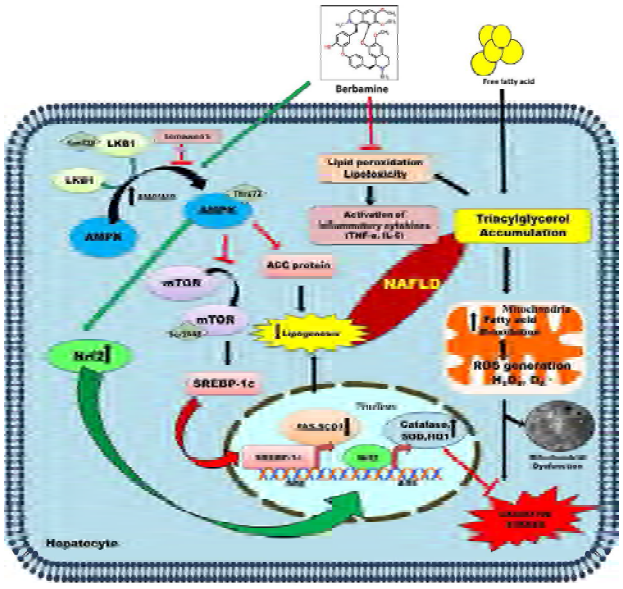
Dr D. Parmar
Area Coordinator

Food is of paramount importance as it is required in sufficient quantity to provide a healthy life. There is an increasing concern about food safety and food contamination either through environmental pollution or adulteration round the globe. To ensure an adequate food supply during non-agriculturally productive periods, it has become necessary to find methods to preserve and process the food. With the fast growth of food processing industries, the trend towards the use of various food additives added for technological purposes has also increased. New chemical entities are being exploited as additives in food. The adulteration of food due to deliberate mixing of inferior grade agents for disguising and to earn undue profits is also a serious problem. Furthermore, un-intentional contaminants may creep up during field production or processing and storage. Recombinant DNA technology for the production of GM food needs be exploited for adequate food supply and simultaneously, the safety of GM food/crop has to be established before commercialization. Based on traditional knowledge, the beneficial effects of herbs remain a promising area for the encountering several toxic manifestations. Thus, toxicity/safety data for these chemical moieties along with GM food and traditionally used herbs need to be generated. Since the institute has contributed immensely in the area of food safety, Food Safety and Standards Authority of India (FSSAI) has recognized the potential of this instutue and has approved for the establishment of Referral Laboratory of FSSAI and Food Reference Centre of FSSAI at CSIR-IITR. The institute also acts as the nodal laboratory for a CSIR Mission mode programme on Food and Consumer Safety Solutions (FOCUS).The issues addressed by the group are (i) development and/or establishment of methodologies to quantify the potential toxic agent in different matrices; (ii) identification of phytochemicals/ herbal preparations, which can mitigate the toxicity of above chemical moieties; (iii) to understand the mechanism of toxicity of new chemical entities; (iv) detection of GM food/crop and their safety/allergenicity assessment and (v) establishment of guidelines for food and chemical safety for regulatory agencies.

Berbamine induced AMPK activation regulates mTOR/SREBP-1c axis and Nrf2/ARE pathway to allay lipid accumulation and oxidative stress in steatotic HepG2 cells

Non-alcoholic fatty liver disease is emanating as a global cataclysm. This study was designed to investigate the antioxidative, anti-inflammatory and fat metabolism-regulating potential of berbamine (BBM), a natural bisbenzylisoquinoline alkaloid. BBM attenuated intracellular lipid accumulation in oleic-acid exposed HepG2 cells (0.5 mM) by inhibiting fatty acid uptake, lipogenesis, and promoting fatty acid β-oxidation by activating AMP activated kinase (AMPK) and peroxisome proliferator-activated receptor (PPAR)-β. Berbamine (5 µM) induced AMPK activation ($P < 0.001$) via LKB1 (Ser-428) and elevated AMP:ATP ratio ($P < 0.001$). AMPK activation negatively regulated mTOR and also constrained the nuclear translocation of SREBP-1c and inhibited the lipogenic proteins, stearoyl-CoA desaturase-1 (SCD-1) and fatty acid synthase (FAS) ($P < 0.001$). BBM stimulated nuclear translocation of redox-sensitive nuclear factor erythroid-2-related factor-2 (Nrf2) and increased hepatic expression of Nrf2 responsive enzymes, HO-1 and Nqo-1. BBM treatment reduced the oxidative burst and proinflammatory responses by significantly enhancing hepatic antioxidant defenses [SOD ($P < 0.001$), catalase ($P < 0.001$) and cellular glutathione ($P < 0.01$)] and diminishing NF-êB regulated pro-inflammatory cytokines (TNF-β, and IL-6) levels respectively. TEM analysis confirmed the disruption of mitochondrial structure and reduction in mitochondrial size (50.97%, $P < 0.001$) in steatotic HepG2 cells which was significantly prevented by 5 ìM BBM treatment (71.84% as compared to control, $P < 0.01$). Pre-treatment of Compound C (AMPK inhibitor, 25 µM) greatly repressed the anti-steatotic properties exhibited by BBM confirming the involvement of AMPK signaling pathway. In summary, the results manifest that BBM reduces intracellular lipid accumulation via AMPK/mTOR/SREBP-1c axis mediated regulation of lipid metabolism and upsurged nuclear stability of Nrf2 by promoting AMPK/Nrf2 association to ameliorate oxidative stress/proinflammatory response.

Sharma A, Anand S, Singh N, Dwivedi U N, Kakkar P. (2020) European Journal of Pharmacology, 882:173244



Graphical Abstract

Barbamine included AMPK activation regulates mTOR-SREBP-lcaxis & NRF-ARE pathway to allay lipidaccumulations oxidative stress in HEPG 2 cells

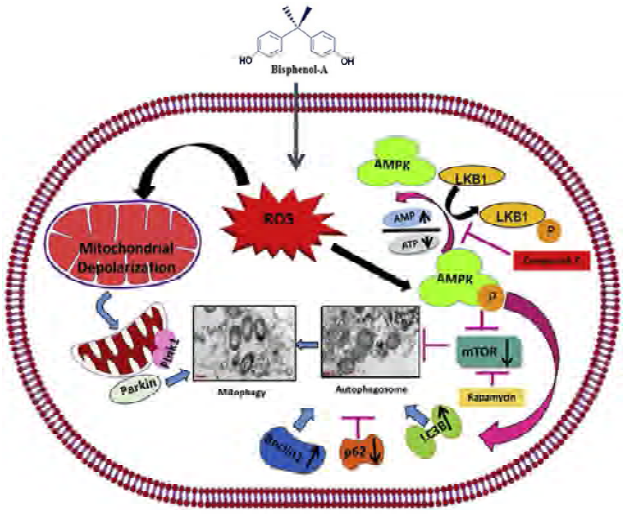
Entrenching role of cell cycle checkpoints and autophagy for maintenance of genomic integrity

Genomic integrity of the cell is crucial for the successful transmission of genetic information to the offspring and its survival. Persistent DNA damage induced by endogenous and exogenous agents leads to various metabolic manifestations. To combat this, eukaryotes have developed complex DNA damage response (DDR) pathway which senses the DNA damage and activates an arsenal of enzymes for the repair of damaged DNA. The active pathways for DNA repair are nucleotide excision repair (NER), base excision repair (BER) and mismatch repair (MMR) for single-strand break repair whereas homologous recombination (HR) and non-homologous endjoining (NHEJ) for double-strand break repair. OGG1 is a DNA glycosylase which initiates BER while Mre11- Rad50-Nbs1 (MRN) protein complex is the primary responder to DSBs which gets localized to damage sites. DNA damage response is meticulously executed by three related kinases: ATM, ATR, and DNA-PK. ATM- and ATR dependent phosphorylation of p53, Chk1, and Chk2 regulate the G1/S, intra-S, or G2/M checkpoints of the cell cycle, respectively. Autophagy is an evolutionarily conserved process that plays a pivotal role in the regulation of DNA repair and maintains the cellular homeostasis. Genotoxic stress-induced altered autophagy occurs in a P53 dependent manner which is also the master regulator of genotoxic stress. A plethora of proteins involved in autophagy is regulated by p53 which involve DRAM, DAPK, and AMPK. As evident, the mtDNA is more prone to damage than nuclear DNA because of its close proximity to the site of ROS generation. Depending on the extent of damage either the repair mechanism or mitophagy gets triggered. SIRT1 is the master regulator which directs.

Anand S, Sharma A, Singh N, Kakkar P (2020) DNA Repair, 86:102748

Activation of autophagic flux via LKB1/AMPK/mTOR axis against xenoestrogen Bisphenol-A exposure in primary rat hepatocytes

Bisphenol-A, an endocrine disruptive chemical widely used to manufacture polycarbonate plastics and epoxy resins, acts via multiple mechanisms that perturb cellular and molecular functions. BPA has the potential to induce hepatotoxicity via generation of ROS and oxidative stress. However, the mechanism of BPA induced oxidative stress and autophagy is still ambiguous at molecular and cellular levels. This study aims to elucidate the impact of BPA exposure (50 and 100 µM) in primary rat hepatocytes. AMP kinase, an intracellular energy sensor and key regulator in cellular signaling were found to be activated during BPA exposure. The increased AMP/ATP ratio and subsequent phosphorylation by its upstream mediator Liver Kinase B1 (LKB1) activates AMPK. BPA down-regulated AMPK downstream molecule i.e. mammalian target of rapamycin (mTOR) by inhibiting its phosphorylation, eventually enhances expression of autophagic markers LC3B, Beclin-1 while lowers p62. Results also revealed that BPA induces mitophagy by promoting accumulation of PINK1 and translocation of Parkin to damaged mitochondria culminating in decreased mitochondrial mass. Ultra-structural changes also confirmed mitochondrial disintegration, enhanced autophagic induction as evident from autophagosome formation. Findings confirm that BPA caused oxidative stress which eventually triggered LKB1/AMPK mediated autophagy and maintains cellular energy



Activation of autophagic fluxiva LKB1/AMPK/mTOR axis against Xenoestrogen BPA esxposure in primary hepatocyte Rad

balance by mitophagic removal of unhealthy mitochondria in primary rat hepatocytes.

Anand S, Sharma A, Singh N, Kakkar P. (2020) Food and Chemical Toxicology, 141: 111314.

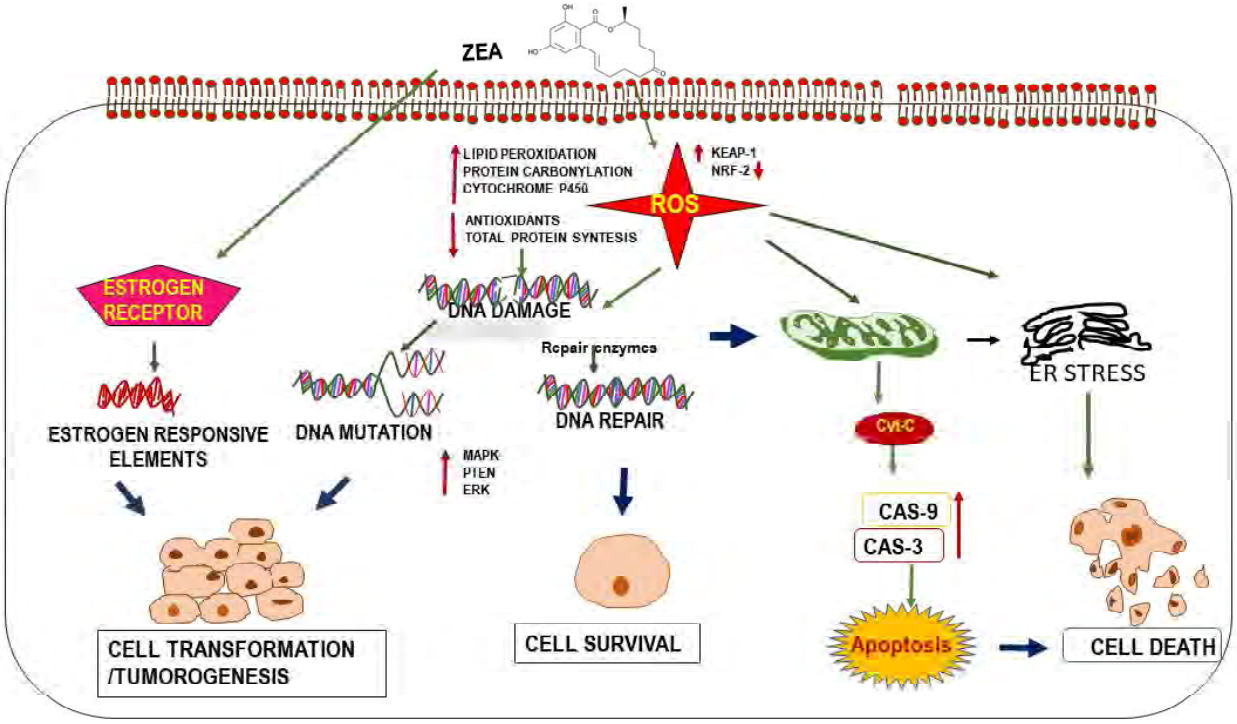
Occurrence and toxicity of a *Fusarium* mycotoxin, Zearalenone

Zearalenone (ZEA) is a mycotoxin produced by the fungi of fusarium genera, which contaminates the cereals and food stuffs worldwide. Fusarium mycotoxins are considered as important metabolites related to animal and human health. Evidences indicate that ZEA has been found to be present in different food stuffs from developed countries like USA, Canada, France, Germany, Japan, etc. and developing nations like Egypt, Thailand, Iran, Croatia, Philippines, etc. The toxicokinetic studies reveal that after oral exposure, ZEA gets absorbed through gastrointestinal tract (GIT), gets distributed to different body parts and metabolized over there. ZEA has been shown to cause reproductive disorders in laboratory animals. In humans, the effects of ZEA have not been studied to great extent, however, limited evidences indicate that ZEA can cause hyper estrogenic syndrome. Though, ZEA causes low acute toxicity, but reports are available confirming the systemic toxicity caused by ZEA. There is no review till date addressing the occurrence, systemic toxicity and the probable mechanisms of ZEA toxicity together. This review addressed the world-wide occurrence and *in vivo* & *in vitro* toxicity studies of ZEA over the past 20 years. The review also discussed the toxicokinetic information on ZEA as well as studies on the systemic toxicity and probable mechanisms of action. In summary, the review not only help in understanding the awareness but also the risk associated with ZEA.

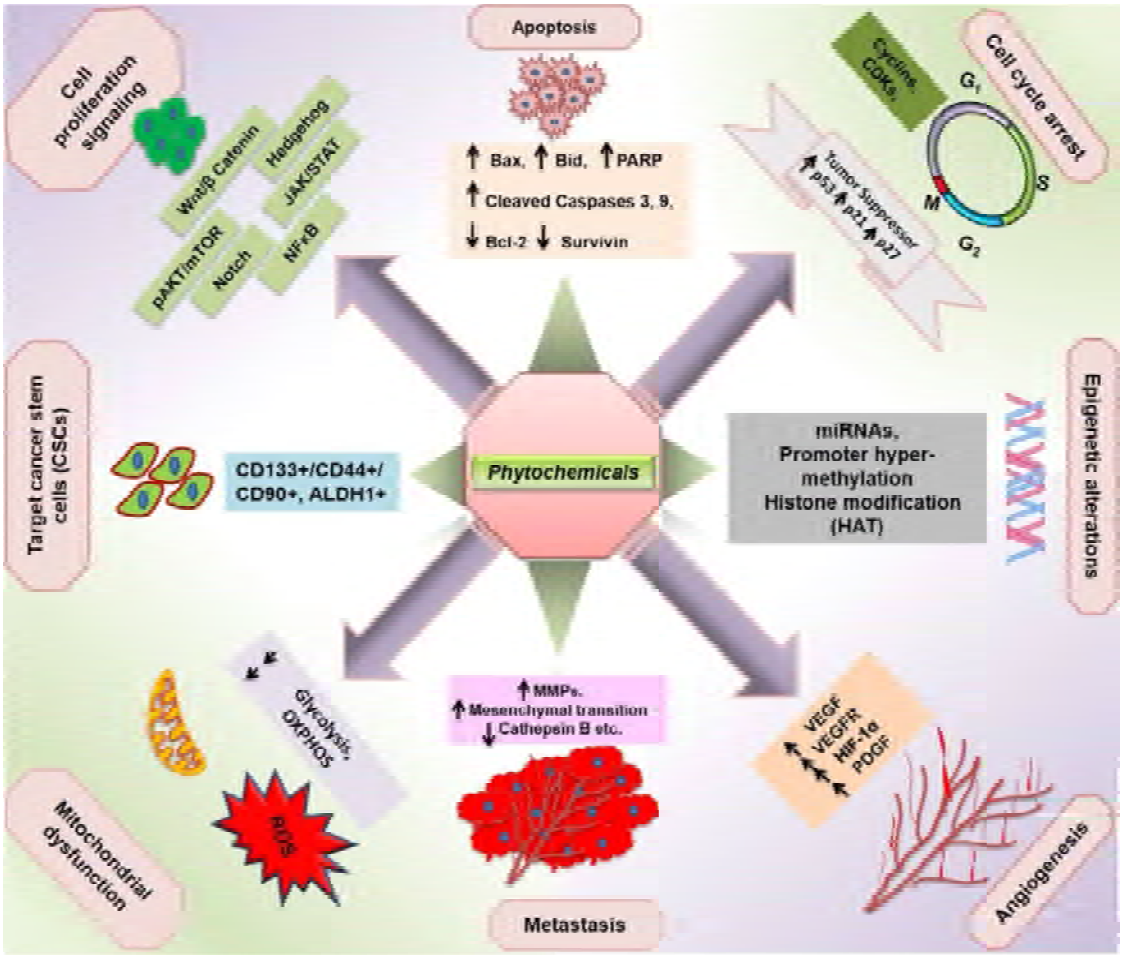
Rai A, Das M, Tripathi A (2019) Critical Reviews in Food Science and Nutrition, 26: 1-20

Safety evaluation of ochratoxin A and citrinin after 28 days repeated dose oral exposure to Wistar rats

Mycotoxins, ochratoxin A (OTA), and citrinin (CTN) are toxic metabolites of filamentous fungi. The most common fungal species that produce OTA and CTN belong to genera *Aspergillus, Penicillium, Fusarium,* and *Monascus,* and these fungal species are found to be contaminant a wide range of grains, food, and food product. This study aimed to evaluate the sub-acute repeated dose oral toxicity of OTA and CTN in experimental rodents by following OECD test guidelines for testing chemicals no. 407 with minor modifications. Twenty-five rats of each sex were divided equally into five groups; vehicle control, OTA 25 µg/kg b. wt., OTA 100 µg/kg b. wt., CTN 25 µg/kg b.wt. and CTN 100 µg/kg b. wt. The results of this study showed no abnormal clinical signs during 28 days of the experimental period. Results did not show any significant changes in body weight gain, food consumption pattern, organ weight, hematology except few parameters, and biochemical values in any of the treatment and control groups. However,



Toxic effects of Zearalenone



Therapeutic effect of phytochemicals and their major limitations in clinical application

histopathological observations revealed severe nephrotoxicity and mild follicular depletion in the spleen of 100 ìg/kg b. wt. treated groups of both OTA and CTN mycotoxins. The findings of this study are first of its kind that reports the systemic toxicity of OTA and CTN oral exposure to laboratory rodents.

Jagdale PR, Indradev, Ayanur A, Singh, D, Md Arshad, Ansari KM (2020) Regulatory Toxicology and Pharmacology, 115: 104700

Phytochemicals based chemopreventive and chemotherapeutic strategies and modern technologies to overcome limitations for better clinical applications

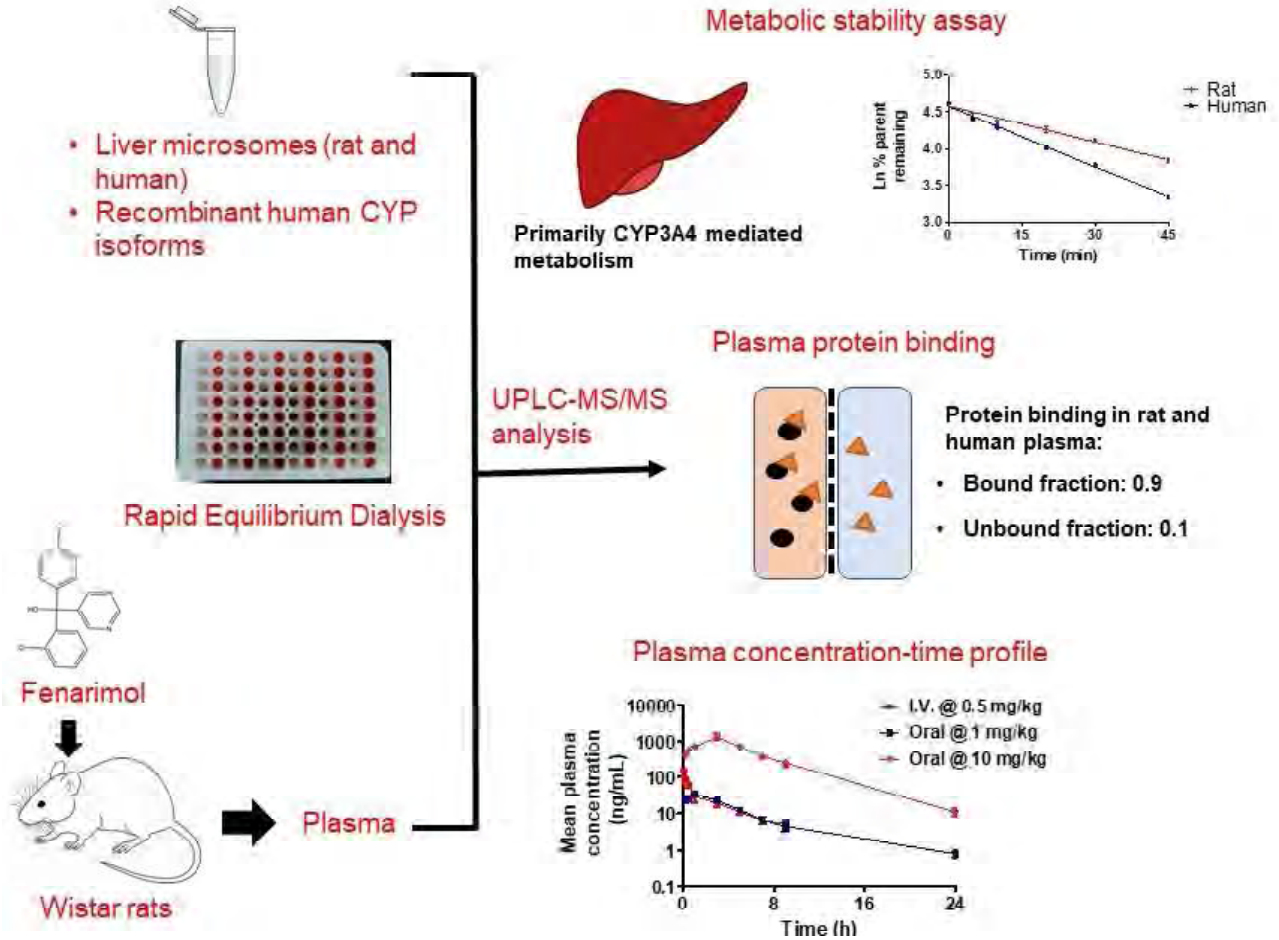
Naturally occurring phytochemicals or plant derivatives are now being explored extensively for their health's benefits and medicinal uses. The therapeutic effect of phytochemicals has been reported in several pathophysiological settings such as inflammatory disorders, metabolic disorders, liver dysfunction, neurodegenerative disorders, and nephropathies. However, the most warranted therapeutic effects of phytochemicals were mapped to their anticancerous and chemopreventive action. Moreover, combining phytochemicals with standard chemotherapy has shown promising results in cancer therapy with minimal side effects and better efficacy. Many phytochemicals, like curcumin, resveratrol, and epigallocatechin-3-gallate, have been extensively investigated for their chemopreventive as well as chemotherapeutic effects. However, poor bioavailability, low solubility, hydrophobicity, and obscure target specificity restrict their therapeutic applications in the clinic. There has been a continually increasing interest to formulate nanoformulations of phytochemicals by using various nanocarriers, such as liposomes, micelles, nanoemulsions, and nanoparticles, to improve their bioavailability and target specificity, thereby maximizing the therapeutic potential. This review, authors has summarized chemopreventive as well as chemotherapeutic action of some common phytochemicals and their major limitations in clinical application. Also, presented an overview of strategies that can improve the efficacy of phytochemicals for their chemotherapeutic value in clinical settings.

Singh VK, Arora D, Ansari MI, Sharma PK (2019). Phytotherapy Research, doi: 10.1002/ptr.6508.

Metabolism, reaction phenotyping, plasma protein binding and toxicokinetic studies of fenarimol in rats at NOAEL dose

Fenarimol (FNL), an organic chlorinated fungicide, is widely used in agriculture for protection from fungal spores or fungi. In spite of serious toxic effects of FNL in various animal models, there is a dearth of information available on toxicokinetics. As information on the kinetic profile supports the scientific rationale for risk assessment decisions, the authors unveiled the toxicokinetics of FNL in Wistar rats following oral and i.v. administration using a sensitive and reliable UPLC-MS/MS method. FNL was extracted using protein precipitation method and quantified in a positive ionization mode using multiple reaction monitoring (MRM). The bioanalytical method developed complied with US FDA guidelines in terms of selectivity, sensitivity, accuracy, precision, dilution integrity, matrix effect and stability. The calibration curve was linear from 0.78 ng/mL to 100 ng/mL. The oral toxicokinetic study at no observed adverse effect level (NOAEL) (1 mg/kg) showed that the peak plasma concentration of FNL was obtained at 1 h with maximum plasma concentration (Cmax) of 33.97 ± 4.45 ng/mL indicating its rapid absorption. Following intravenous administration, FNL displayed a clearance of 42.48 mL/min/kg and absolute oral bioavailability observed was ~ 45.25% in rats. Oral toxicokinetics at a dose of 10 mg/kg body weight, showed disproportionate increase in the systemic exposure of FNL, clearly indicating the evidence of non-linear kinetics. The predicted *in vivo* hepatic clearance (36.71 ml/min/kg) of FNL in rats using well stirred model was comparable with the observed *in vivo* clearance (42.48 ml/min/kg) value after i.v. dosing implying hepatic metabolism as the main pathway of FNL elimination. The predicted *in vivo* hepatic clearance in humans was found to be 14.39ml/min/kg. Reaction phenotyping assay showed that CYP3A4 mainly contributed to the overall metabolism of FNL. *In vitro* plasma protein binding and metabolism study revealed FNL as high protein bound and intermediate clearance compound in both rat and human. The findings obtained in the present work could further be employed to predict the fate of this fungicide in humans.

Karsauliya K, Sonker AK, Bhateria M, Taneja I, Srivastava A, Sharma M, Singh SP (2020) Xenobiotica. doi: 10.1080/00498254.2020.1796170



In-vitro and *in-vivo* toxicokinetics characterization of fenarimol

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Nanomaterial Toxicology

Dr Alok K. Pandey
Area Coordinator

The institute has been working in the area of nanotoxicology for more than a decade and has been able to develop expertise, with a critical mass of its scientific manpower contributing in this emerging area of toxicology. CSIR-IITR spearheaded two major network projects of CSIR on nanotechnology and was a partner in six international flagship projects of EU-FP7, UK, Spain and Japan. The institute took lead in the synthesis and characterization of engineered nanomaterials (ENMs), development of methodology/assays/techniques for toxicity assessment, guidelines for nanosafety, alternate models, and mechanisms of action and interaction of ENMs with biological systems. The institute has created vibrant network in the area of nanotechnology with IITs, IISc, universities, research institutes and industries. To assess the safety/toxicity of nanomaterials, some of the most critical issues that need to be addressed include: i) effect of shape and size; ii) dosimetry; iii) route of delivery and tracking; iv) development and validation of test models; v) *in vitro* vs. *in vivo* extrapolation; vi) ecotoxicity; vii) computational nanotoxicity and viii) life cycle analysis. The scientists of the nanomaterial toxicology group aim to investigate the health and environmental effects of nanomaterials, to delineate their toxicity and assure safe usage in consumer products, healthcare products and medical devices.

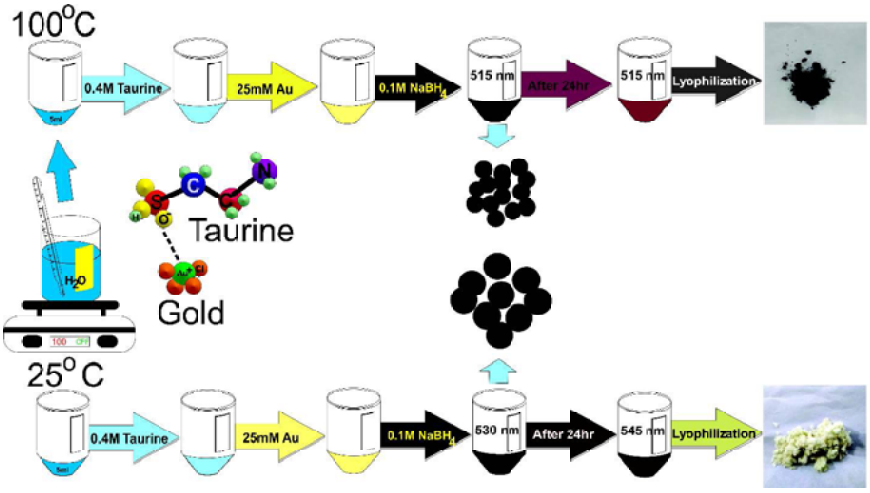
Efficient antileishmanial activity of amphotericin B and piperine entrapped in enteric coated guar gum nanoparticles

Amphotericin B (AmB) exhibits potential antileishmanial activity, with only a little rate of recurrence. However, low bioavailability and severe nephrotoxicity are among the major shortcomings of AmB-based therapy. To reduce the nonspecific tissue distribution, toxicity and the cost of the treatment, a nanoformulation of AmB and piperine (Pip), a plant alkaloid, was developed by entrapping them in guar gum, a macrophage targeting polymer. These nanoparticles (NPs) were further coated with eudragit to make them suitable for oral administration. The formulated eudragit-coated AmB and Pip-loaded NPs (Eu-HDGG-AmB-Pip-NPs) exhibited controlled release of the loaded therapeutic agents and protected the drug from acidic pH. These NPs exhibited effective suppression of growth of both promastigotes and amastigotes of *Leishmania donovani* parasite under *in vitro* conditions. *In vivo* evaluation of these NPs for therapeutic efficacy in golden hamster-*L. donovani* model demonstrated enhanced drug bioavailability, non-nephrotoxic nature, and potential antileishmanial activity with up to 96% inhibition of the parasite.

Ray L, Karthik R, Shrivastava V, Singh SP, Pant AB, Goyal N, Gupta KC. (2020). Drug Delivery and Translational Research, doi: 10.1007/s13346-020-00712-9.

A novel approach towards synthesis and characterization of non-cytotoxic gold nanoparticles using taurine as capping agent

The authors have shown in their research a novel process of synthesizing gold nanoparticles using Taurine. Taurine has been used for the first time as capping for metal nanoparticles since it is widely used in consumer applications owing to its non-cytotoxic nature. The research has shown that gold nanoparticles synthesized at different experimental conditions had strong influence on determining the size of nanoparticles. Average size of 6nm and 46nm were synthesized via wet chemical reduction method. It is shown that taurine is a better alternative to cetyltrimethyl ammonium bromide (CTAB) that is highly toxic to cells and limits biological applications. Various techniques were performed for determining the physico-chemical properties of metal nanospheres capped with taurine. It is shown that taurine acts as a capping and stabilizing agent for gold



A novel approach for synthesizing tunable sizes of gold nanospheres using taurine as a non-cytotoxic capping agent

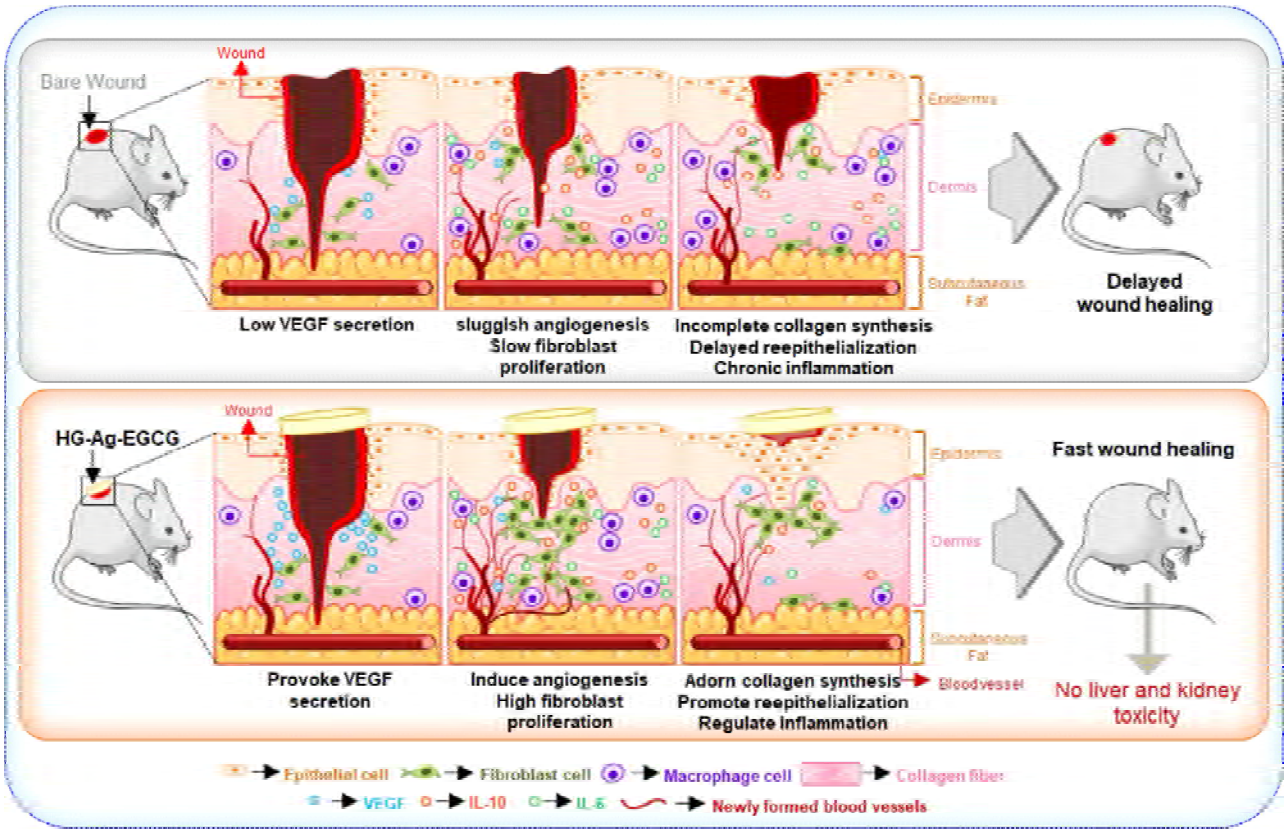
nanospheres. The research has led towards biological applications because the synthesized nanoparticles with taurine showed no toxicity on human liver carcinoma cells.

Kumar A, Das N, Satija NK, Mandrah K, Roy SK, Rayavarapu RG (2020) Nanomaterials, 10:45

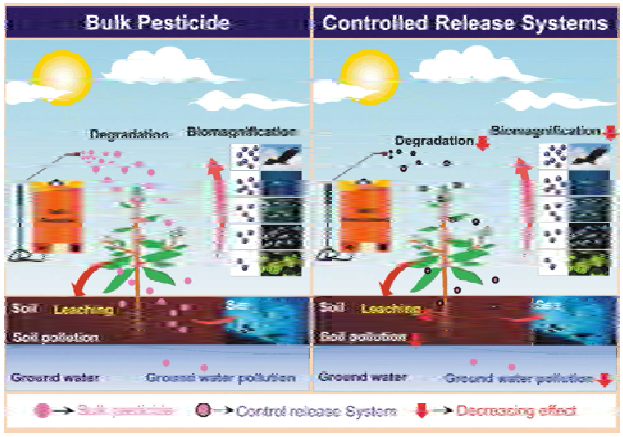
Polymer assisted *in situ* synthesis of silver nanoparticles with epigallocatechin gallate (EGCG) impregnated wound patch potentiate controlled inflammatory responses for brisk wound healing

An ideal wound dressing material needs to be predisposed with desirable attributes like anti-infective effect, skin hydration balance, adequate porosity and elasticity, high mechanical strength, low wound surface adherence, and enhanced tissue regeneration capability. In this work, authors have synthesized hydrogel-based wound patches having antibacterial silver nanoparticles and antioxidant epigallocatechin gallate (EGCG) and showed fast wound closure through their synergistic interaction without any inherent toxicity. Wound patches were synthesized from modified guar gum polymer and assessed to determine accelerated wound healing. The modified polymer beget chemical-free *in-situ* synthesis of monodispersed silver NPs (~12 nm), an antimicrobial agent, besides lending ionic surface charges. EGCG impregnated during ionotropic gelation process amplified the efficacy of wound patches that possess apt tensile strength, porosity, and swellability for absorbing wound exudates. Further, *in vitro* studies endorsed them as non-cytotoxic and the post agent effect following exposure to the patch showed an unbiased response to *E. coli* K12 and *B. subtilis*. *In vivo* study using sub-cutaneous wounds in Wistar rats validated its accelerated healing properties when compared to a commercially available wound dressing material (skin graft; Neuskin-F®) through better wound contraction, promoted collagen deposition and enhanced vascularization of wound region by modulating growth factors and inflammatory cytokines. Synthesized wound patches showed all the desired attributes of a clinically effective dressing material and the results were validated in various *in vitro* and *in vivo* assays

Kar AK, Singh A, Dhiman N, Purohit MP, Jagdale P, Kamthan M, Singh D, Kumar M, Ghosh D, Patnaik S (2019) International Journal of Nanomedicine, 14: 9837-9854.



Schematic representation of the *in vivo* activity of developed Hg-Ag-EGCG wound patch in repithelialization



Schematic representation of advantages of CRSs over conventional pesticides

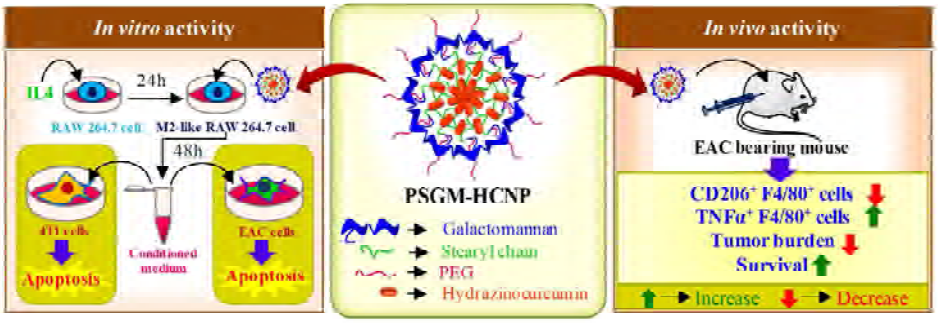
Advances in controlled release pesticide formulations: Prospects to safer integrated pest management and sustainable agriculture

As the world is striving hard towards sustainable agricultural practices for a better tomorrow, one of the primary focuses is on effective pest management for enhanced crop productivity. Despite newer and potent chemicals as pesticides, there are still substantial crop losses, and if by any means this loss can be tackled; it will alleviate unwanted excessive use of chemical pesticides. Scientific surveys have already established that pesticides are not being utilized by the crops completely rather a significant amount remains unused due to various limiting factors such as leaching and bioconversion, etc., resulting in an adverse effect on human health and ecosystems. Concerted efforts from scientific diaspora toward newer and innovative strategies are already showing promise, and one such viable approach is controlled release systems (CRS) of pesticides. Moreover, to bring these smart formulations within the domain of current pesticide regulatory framework is still under debate. It is thus, paramount to discuss the pros and cons of this new technology vis-a-vis the conventional agrarian methods. This review deliberates on the developmental updates in this innovative field from the past decades and also appraises the challenges encumbered. Additionally, critical information and the foreseeable research gaps in this emerging area are highlighted.

Singh A, Dhiman N, Kar AK, Singh, D, Purohit MP, Ghosh D, Patnaik S. (2019). Journal of Hazardous Materials, 385: 121525.

Pro-inflammatory macrophage polarization enhances the anticancer efficacy of hydrazinocurcumin contained self-assembled galactomannan nanoparticles

Galactomannan (GM), a natural polymer, is recognized to specifically target macrophage mannose receptors (CD206). Interestingly, some reports indicate that GM has an ability to induce pro-inflammatory (M1-like, tumericidal) polarization in macrophages, suggesting its potential use as an anti-cancer agent. Hydrazinocurcumin (HC), a pyrazole derivative of curcumin, is reported to possess increased anti-cancer efficacy over curcumin. Moreover, HC-encapsulated nanoparticles (NPs) have been reported to re-polarize tumor-associated macrophages (TAMs) from anti-inflammatory (M2-like, tumor-promoting) to proinflammatory phenotype. To club the therapeutic properties of both GM and HC, author synthesized self-assembled amphiphilic PEGylated GM NPs loaded with HC (PSGM-HCNPs) and evaluated their potential to re-polarize TAMs towards M1-like phenotype. PSGM-HCNPs re-polarized IL-4 polarized RAW 264.7 cells via a phenotypic switch from M2- to M1-like by elevating ROS level, decreasing CD206 and arginase-1 expressions and increasing pro-inflammatory cytokines' secretion. Conditioned medium (CM) taken from re-polarized RAW264.7 cells containing residual PSGM-HCNPs elevated ROS, arrested cell cycle, and induced apoptosis in 4T1, breast cancer cells, and Ehrlich's ascites carcinoma (EAC) cells. Decreased levels of MMP-2, MMP-9, and Bcl-2 with increased levels of Bax in both 4T1 and EAC cells indicated anti-metastatic and apoptosis inducing potential of the CM. Treatment of PSGM-HCNPs in EAC-bearing mice reduced tumor burden, increased their survival time, decreased $CD206^{+}F4/80^{+}$ cells, and increased $TNF\text{-}á^{+}F4/80^{+}$ cells signifying decrease in M2- and increase in M1-like skewness among ascitic TAMs.



Hydrazinocurcumin-loaded galactomannan nanoparticles exhibited *in vitro* and *in vivo* anticancer efficacy via involvment of pro-inflammatory polarization in macrophages.

Kumari M, Purohit M, Pahuja R, Patnaik S, Shukla Y, Kumar P, Gupta KC. (2019). Drug Delivery and Translational Research, 9: 1159-1188.

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Regulatory Toxicology

Dr Akshay Dwarkanath
Area Coordinator

Regulatory toxicology group is involved in the generation of analytical data in different matrices and safety data for intermediaries and finished products. This endeavour helps regulatory agencies in decision making vis-à-vis production, marketing and usage of a vast variety of industrial chemicals, agrochemicals, pharmaceuticals, cosmetic products, food/feed additives, etc. Compliance to Good Laboratory Practices (GLPs) is the key to international acceptance of safety data/reports on industrial, pharmaceutical, food/feed and consumable products. A state of the art GLP Test facility for regulatory toxicology studies has been created since 2014. CSIR-IITR is the first CSIR laboratory and second in the Government Sector to obtain GLP certification for toxicity testing. Our constant efforts to expand the scope of the GLP Facility resulted into getting certification for "Environmental studies on aquatic and terrestrial organisms" in April 2016 which makes it the only GLP certified laboratory in the government sector to carry out ecotoxicology studies. The facility has further extended its scope for chronic toxicity studies, *in vitro* mutagenicity studies, primary skin irritation and skin sensitization tests during the re-certification of the facility in 2017. Compliance to Good Laboratory Practices (GLPs) is the key to international acceptance of safety data/reports on industrial and consumable products and the group has tirelessly strived to increase the scope of safety studied under GLP Certification. More recently, in June 2019, during the surveillance inspection of the facility, inhalation toxicity studies and four more ecotoxicity studies in aquatic model systems were brought under the scope of GLP Certification.

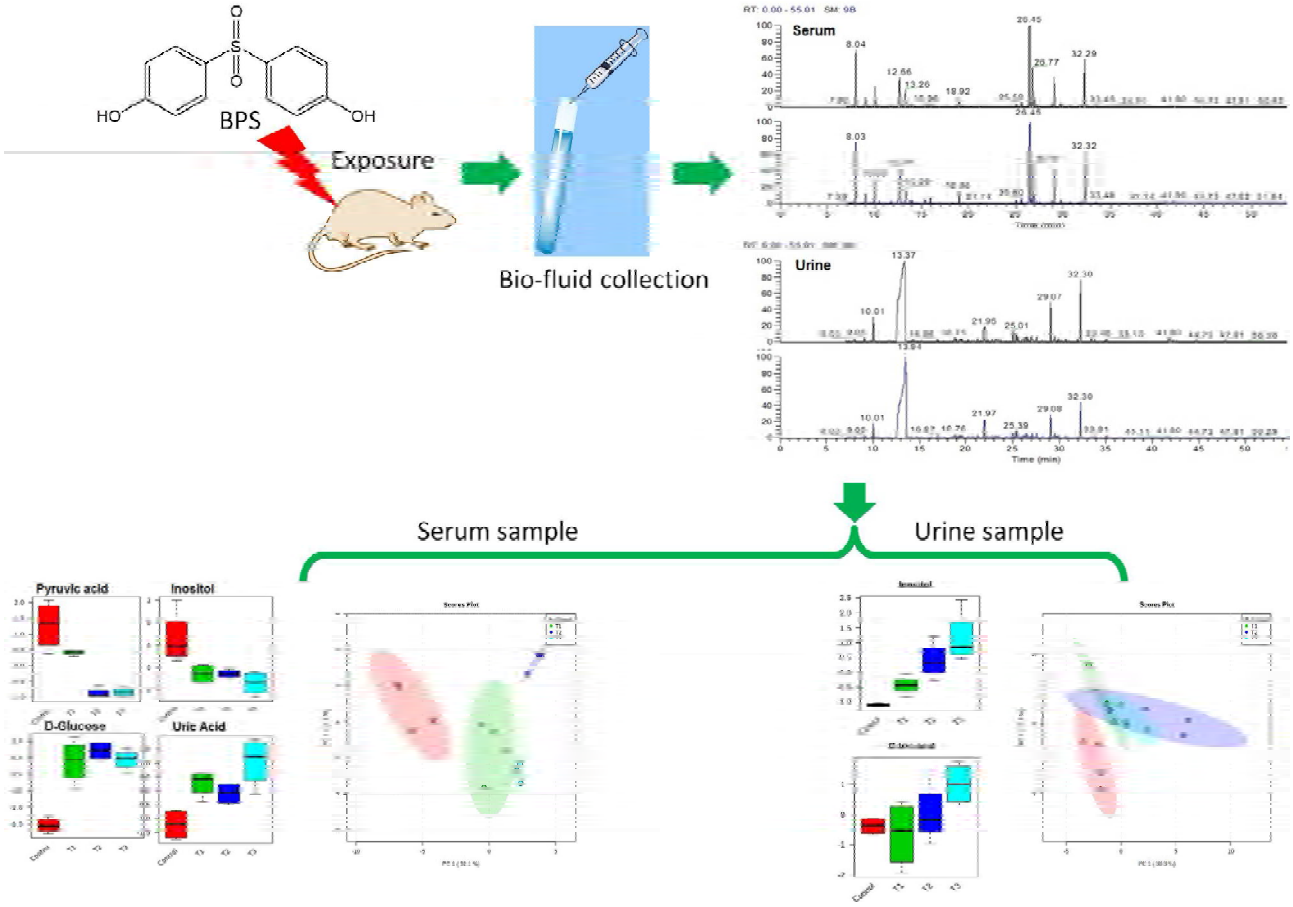
This facility supports the cause of "Make in India" by carrying out safety assessment of chemicals, materials and products developed by small and medium enterprises for their global positioning. The existing facilities are constantly being upgraded following National/International guidelines to provide scientific knowledge to society, forge linkages with industry and for all round sustainable development.

Organic pollutants are a ubiquitous contaminant in ecosystems. Most of the contaminants are lipophilic and thus accumulate in higher trophic level organisms, get transferred through the food chain to humans and finally induce harmful effects. It is, therefore, critical from the human health perspective to continue monitoring residues in culinary samples collected from various parts of ecosystem. Also, it is important to develop and validate methods for rapid estimation of large number of pollutants so that timely intervention strategies can be planned. The issues addressed by the Regulatory Toxicology Group are: (i) development of newer analytical methods for characterization and quantification of chemicals and (ii) toxicological/safety evaluation of chemicals and products as per GLP guidelines. Objectives of the Group are:

- Development of newer analytical methods for characterization and quantification of chemicals.
- Toxicological/safety evaluation of chemicals and products as per GLP guidelines.
- Maintenance and supply of healthy laboratory animals for R&D programmes.

Metabolomic perturbation precedes glycolytic dysfunction and procreates hyperglycemia in a rat model due to bisphenol-S exposure

Bisphenol-S (BPS) is an industrial chemical responsible for harmful effects comparable to its known congener bisphenol A (BPA). This study aimed to investigate the possible perturbed expression of endogenous metabolites in serum and urine samples of Wistar rats, exposed to three different concentrations of BPS. Experimentally, the Oral Glucose Tolerance Test (OGTT) and Insulin Tolerance Test (ITT) confirmed the induced hyperglycemic condition by sub-chronic exposure to BPS in Wistar rats. Metabolomic profiling of serum and urinary metabolites was done using Gas Chromatography-Mass Spectrometry (GC–MS) analysis. The metabolomics data were represented by one way ANOVA, principal component analysis (PCA), partial least squares discriminant analysis (PLS-DA) along with the mapping of perturbed metabolic pathways. Manifestation of hyperglycemia was observed in treated animals with median and high doses by OGTT and ITT. A significant perturbation was found mainly in the levels of amino acids, sugars, and organic acids in metabolomic profiling of serum and urine samples. In addition, the altered systematic



Analysis of metabolic perturbation induced by Bisphenol-S exposure in Wistar rats

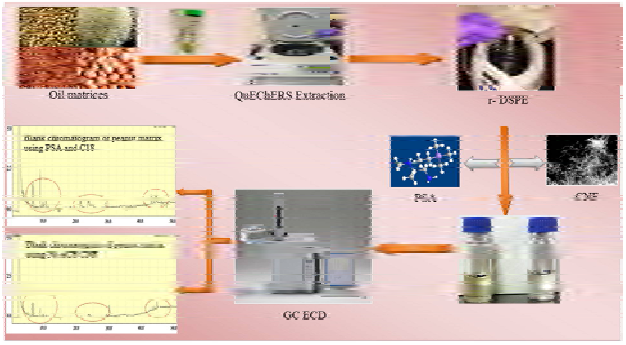
pathways due to BPS exposure were determined using the Kyoto Encyclopedia of Genes and Genomes (KEGG) based pathway analysis.

Mandrah K, Jain V, Ansari JA, Roy SK (2020) Environmental Toxicology and Pharmacology, 77: 103372.

Carbon nanofibers as an efficient DSPE sorbent for sample cleanup in QuEChERS method of multi-class pesticide residue analysis in high fat and low water commodities using GC-ECD

Catalytic chemical vapor deposition (CVD) grown carbon nanofibers (CNFs) dispersed on activated carbon fibers (ACFs) were assessed as a reversed-dispersive solid-phase extraction (r-DSPE) material for the simplification and improvement of the process of sample clean-up in the quick, easy, cheap, effective, rugged and safe (QuEChERS) procedure. In this study, twenty-seven multi-class pesticides were determined in high fat and low water commodities/ matrices (peanut, soybean, sesame, and flaxseed) using gas chromatograph equipped with an electron capture detector (ECD). The optimized amount of prepared Ni-ACF/CNF was 10 mg on the basis of clean-up performance and recoveries. The obtained recoveries from all twenty-seven pesticides in all commodities/matrices were found to be in the range of ~72 - ~117% with relative standard deviation values d”15%. The limit of detection and quantification values were 0.7-3.8 ng/g and 2.3-12.5 ng/g respectively. The results obtained had clearly demonstrated the Ni-ACF/CNF was alike potent to primary secondary amine(PSA) with C18 sorbent, which are commonly applied to high fat and low water commodities/matrices real samples analysis.

Singh M, Srivastava A, Sharma YK, Singh S, Singh SP. (2020). Microchimica Acta. doi: 10.1007/s00604-020-04464-8.



Multi-class pesticide residue analysis in high fat and low water commodities using carbon nanofibers as an efficient DSPE sorbent for sample clean-up

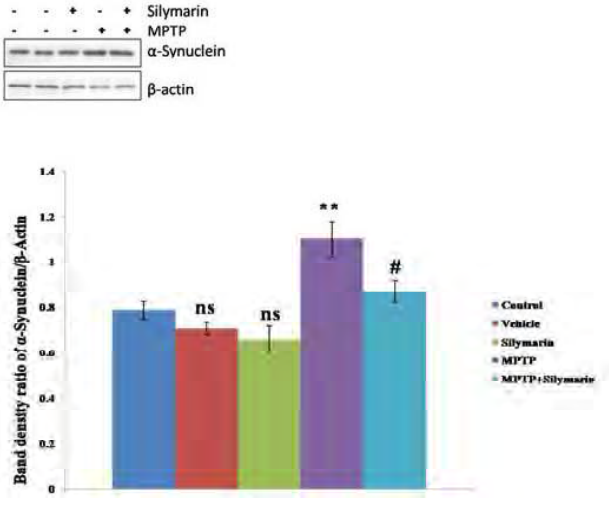
Systems Toxicology and Health Risk Assessment

Dr D. Parmar
Area Coordinator

Humans are exposed to many chemicals through the environment and in the form of drugs. In order to understand the risk to human health of drug and chemical exposure, it is necessary to understand how these xenobiotics may affect normal cellular processes and lead to toxicological consequences. The advent of high throughput genomic screens has led to the possibility of much greater breadth of understanding of the effect of xenobiotics in biological systems. Furthermore, there has been interest in the possibility of using the output of these genomic assays as a signature of xenobiotic exposure, and thus as a test procedure for the recognition of toxicological hazard. The group aims to apply a system biology approach to describe and predict the effects of chemicals and other environmental stressors at different levels of biological organization and identify key events leading to adverse health outcomes. The group also aims to study the perturbation of biological systems by chemicals and stressors, monitoring changes in molecular expression and conventional toxicological parameters, iteratively integrating data to achieve a mechanistic understanding of the specific toxicity and eventually develop and validate biomarkers for predicting these toxicological responses. The development of an integrated framework through the identification of toxicological pathways and data analysis tools is an integral part of the overall attempt to understand the adverse effects of chemicals and other stressors on human health and the environment. Particular focus has been on the development, assessment and application of methods to assess the adverse effects of environmental chemicals. Further, the endeavour has been on the evaluation of Integrated Testing Strategies to describe all the toxicological interactions that occur within a living system under stress and use the knowledge of toxicogenomic responses in one species to predict the mode of action of similar agents in other species. The issues addressed by the group are : (i) study the perturbation of biological systems by chemicals and stressors; (ii) monitoring changes in molecular expression and conventional toxicological parameters and integrating data to achieve a mechanistic understanding of the specific toxicity and (iii) develop and validate biomarkers for predicting the toxicological responses.

Silymarin protects against impaired autophagy associated with 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine-induced Parkinsonism

1-Methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) exacerbates mitochondrial impairment and α-synuclein expression leading to Parkinsonism. Impaired mitochondria and over-expressed α-synuclein are degraded and eliminated via macroautophagy and chaperone-mediated autophagy. Owing to multiple properties, silymarin protects from oxidative stress-mediated cellular injury. However, its effect on MPTP-induced changes in autophagy is not yet known. The study aimed to decipher the effect of silymarin on MPTP-induced changes in autophagy. Male mice (20-25 g) were treated with silymarin (intraperitoneally, daily, 40 mg/kg) for 2 weeks. On day 7, a few animals were also administered with MPTP (intraperitoneally, 20 mg/kg, 4 injections at 2-h interval) along with vehicles. Striatal dopamine content was determined. Western blot analysis was done to assess α-synuclein, beclin-1, sequestosome, phosphorylated 5' adenosine monophosphate-activated protein kinase (p-AMPK), lysosome-associated membrane protein-2 (LAMP-2), heat shock cognate-70 (Hsc-70), LAMP-2A, phosphorylated unc-51-like autophagy activating kinase (p-Ulk1), and phosphorylated mechanistic target of rapamycin (p-mTOR) levels in the nigrostriatal tissue. Silymarin rescued from MPTP-induced increase in beclin-1, sequestosome, p-AMPK, and p-Ulk1 and decrease in



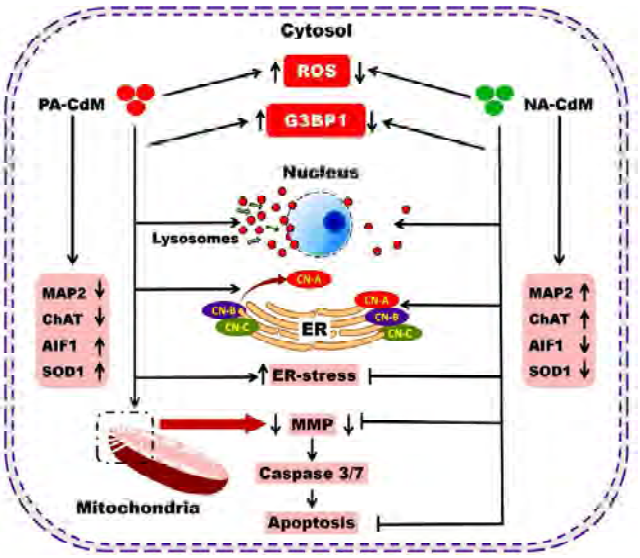
Silymarin rescued from MPTP-induced changes in the expression of α-synuclein. Western blot (upper panel) and band density ratio (lower panel) of α-synuclein are shown with relation to β-actin. Values are shown in mean ± standard error (n=3) and noteworthy changes are presented in ** $p<0.01$ with relation to control and # $p<0.05$ with relation to MPTP-treated group.

LAMP-2, p-mTOR, and LAMP-2A levels. Silymarin defended against MPTP-induced increase in α-synuclein and reduction in dopamine content. The results demonstrate that silymarin protects against MPTP-induced changes in autophagy leading to Parkinsonism.

Tripathi MK, Rasheed MSU, Mishra AK, Patel DK, Singh MP (2020) Journal of Molecular Neuroscice, 70: 276-283

Mechanistic insights of astrocyte-mediated hyperactive autophagy and loss of motor neuron function in SOD1 L39R linked amyotrophic lateral sclerosis

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disorder with no cure. The reports showed the role of nearby astrocytes around the motor neurons as one among the causes of the disease. However, the exact mechanistic insights are not explored so far. Thus, in the present investigation, authors employed the induced pluripotent stem cells (iPSCs) of Cu/Zn-SOD1L39R linked ALS patient to convert them into the motor neurons (MNs) and astrocytes. Authors report that the higher expression of stress granule (SG) marker protein G3BP1, and its co-localization with the mutated Cu/Zn-SOD1L39R protein in patient's MNs and astrocytes are linked with AIF1-mediated upregulation of caspase 3/7 and hyperactivated autophagy. They also observed the astrocyte-mediated non-cell-autonomous neurotoxicity on MNs in ALS. The secretome



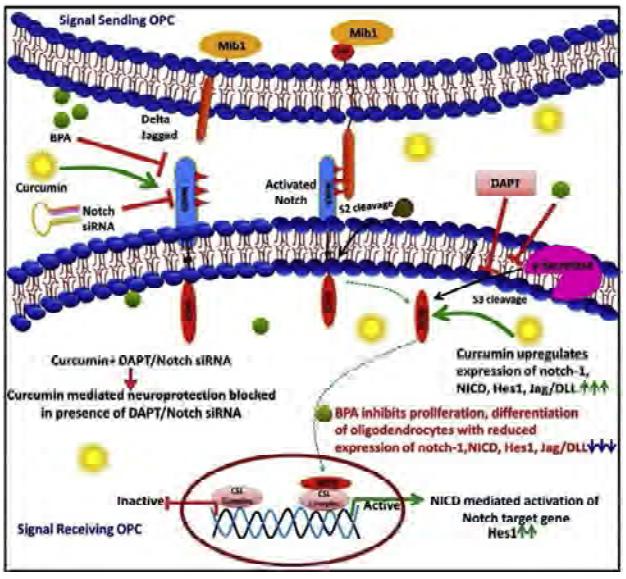
Mechanistic insights of astrocyte mediated hyperactive autophagy

of the patient's iPSC-derived astrocytes exerts significant oxidative stress in MNs. The findings suggest the hyperactive status of autophagy in MNs, as witnessed by the co-distribution of LAMP1, P62, and LC3 I/II with the autolysosomes. Conversely, the secretome of normal astrocytes has shown neuroprotection in patient's iPSC-derived MNs. The whole-cell patch-clamp assay confirmed their findings at a physiological functional level in MNs. Perhaps for the first time, authors reported that the MN degeneration in ALS triggered by the hyper-activation of autophagy and induced apoptosis in both cell-autonomous and non-cell-autonomous conditions.

Rajpurohit CS, Kumar V, Arquimedes C, Oliveira D, Ulrich H, Okamoto OK, Zatz M, Ansari UA, Khanna VK, Pant AB. (2020). Molecular Neurobiology, doi: 10.1007/s12035-020-02006-0.

Notch pathway up-regulation via curcumin mitigates bisphenol-A (BPA) induced alterations in hippocampal oligodendrogenesis

CNS myelination process involves proliferation and differentiation of oligodendrocyte progenitor cells (OPCs). Defective myelination causes onset of neurological disorders. Bisphenol-A (BPA), a component of plastic items, exerts adverse effects on human health. Authors' previous studies indicated that BPA impairs neurogenesis and myelination process stimulating cognitive dysfunctions. But, the underlying mechanism(s) of BPA induced de-myelination and probable neuroprotection by curcumin remains elusive. Authors found that curcumin protected BPA mediated adverse effects on oligosphere growth kinetics. Curcumin significantly improved proliferation and differentiation of OPCs upon BPA exposure both *in-vitro* and *in-vivo*. Curcumin enhanced the mRNA expression and protein levels of myelination markers in BPA treated rat hippocampus. Curcumin improved myelination potential via increasing β-III tubulin-/MBP$^+$ cells (neuron-oligodendrocyte co-culture) and augmented fluoromyelin intensity and neurofilament/MBP$^+$ neurons *in vivo*. *In silico*



Notch pathway up-regulation via curcumin mitigates bisphenol-A (BPA) induced alterations in hippocampal oligodendrogenesis

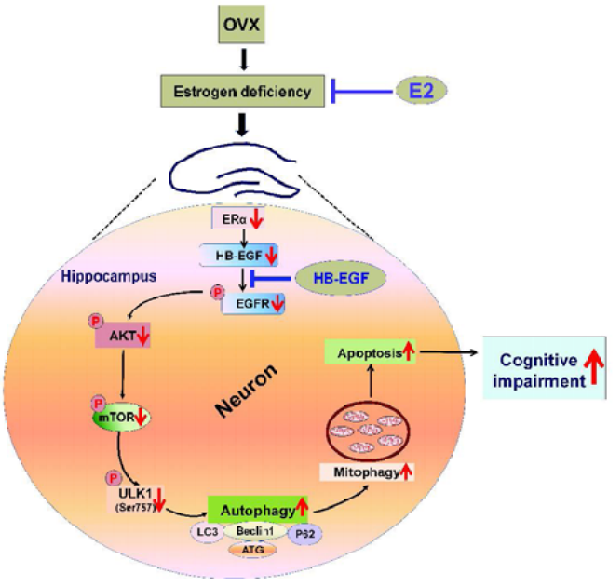
docking studies suggested Notch pathway genes (Notch-1, Hes-1 and Mib-1) as potential targets of BPA and curcumin. Curcumin reversed BPA mediated myelination inhibition via increasing the Notch pathway gene expression. Genetic and pharmacological Notch pathway inhibition by DAPT and Notch-1 siRNA exhibited decreased curcumin mediated neuroprotection. Curcumin improved BPA mediated myelin sheath degeneration and neurobehavioral impairments. Altogether, results suggest that curcumin protected BPA induced de-myelination and behavioural deficits through Notch pathway activation.

Tandon A, Singh SJ, Gupta M, Singh N, Shankar J, Arjaria N, Goyal S, Chaturvedi RK (2020) Journal of Hazardous Material, 392: 122052.

Estrogen deficiency induces memory loss via altered hippocampal HB-EGF and autophagy

Estrogen deficiency reduces estrogen receptor-alpha (ERα) and promotes apoptosis in the hippocampus, inducing learning-memory deficits; however, underlying mechanisms remain less understood. Here, authors explored the molecular mechanism in an ovariectomized (OVX) rat model, hypothesizing participation of autophagy and growth factor signaling that relate with apoptosis. They observed enhanced hippocampal autophagy in OVX rats, characterized by increased levels of autophagy proteins, presence of autophagosomes and inhibition of AKT-mTOR signaling. Investigating upstream effectors of reduced AKT-mTOR signaling revealed a decrease in hippocampal heparin-binding epidermal growth factor (HB-EGF) and p-EGFR. Moreover, 17β-estradiol and HB-EGF treatments restored hippocampal EGFR activation and alleviated downstream autophagy process and neuronal loss in OVX rats. *In vitro* studies using estrogen receptor (ERα)-silenced primary hippocampal neurons further corroborated the *in vivo* observations. Additionally, *in vivo* and *in vitro* studies suggested the participation of an attenuated hippocampal neuronal HB-EGF and enhanced autophagy in apoptosis of hippocampal neurons in estrogen- and ERα-deficient conditions. Subsequently, they found evidence of mitochondrial loss and mitophagy in hippocampal neurons of OVX rats and ERα-silenced cells. The ERα-silenced cells also showed a reduction in ATP production and an HB-EGF-mediated restoration. Finally in concordance with molecular studies, inhibition of autophagy and treatment with HB-EGF in OVX rats restored cognitive performances, assessed through Y-Maze and passive avoidance tasks. Overall, this study, for the first time, links neuronal HB-EGF/EGFR signaling and autophagy with ERα and memory performance, disrupted in estrogen-deficient condition.

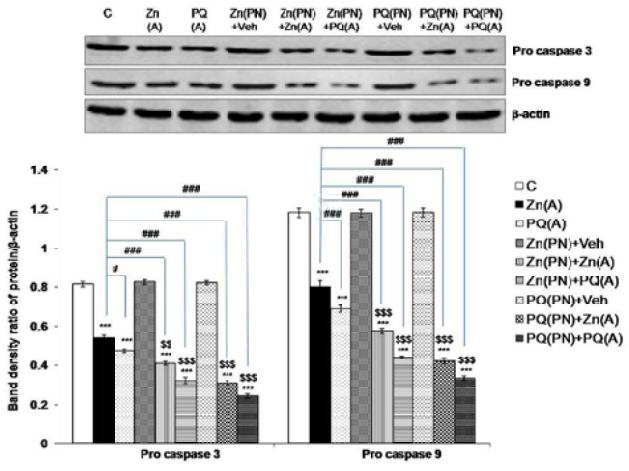
Pandey R, Shukla P, B. Anjum, Himanshu, Gupta PK, Pal S, Arjaria N, Gupta K, Chattopadhyay N, Sinha RA, Bandyopadhyay S. (2020). Journal of Endocrinology, 244:53-70.



Estrogen (E2) deficiency attenuates ERα and then suppresses HB-EGF/-dependent EGFR activation in hippocampal neurons. Reduced HB-EGF/EGFR signaling further down-regulates AKT/mTOR/ULK1 pathway of autophagy regulation, resulting in increased LC3/Beclin an decreased p62-mediated autophagy and mitochondrial loss. This deregulated HB-EGF/EGFR and autophagy pathway forms a key reason for hippocampal neuronal apoptosis and learning-memory impairment in E2 deficient females, which may be inhibited by E2 or HB-EGF supplementation.

Postnatal zinc or paraquat administration increases paraquat or zinc-induced loss of dopaminergic neurons: Insight into augmented neurodegeneration

The current study explored the effect of developmental exposure to zinc (Zn), a metal or paraquat (PQ), a pesticide on the nigrostriatal dopaminergic neurons of rats challenged to Zn or PQ during adulthood. Exposure of Zn or PQ during adulthood alone exhibited marked reduction in motor activities, striatal dopamine and metabolites, glutathione content and number of dopaminergic neurons. However, the levels of lipid peroxidation, protein carbonyls, superoxide dismutase activity, pro-inflammatory cytokines and 4-hydroxynonenal-protein adducts were increased. While the expression of vesicular monoamine trans-porter-2 and tyrosine hydroxylase were attenuated, dopamine transporter and microglial marker Iba-1 expression, activated microglia, nuclear factorkappa B activation, mitochondrial cytochromec release and caspase-3/9 activation were augmented following Zn or PQ exposure. Albeit postnatal alone exposure did not alter any of the studied parameters, the developmental administration of Zn/PQ in rechallenged adult rats produced more pronounced changes in the aforementioned variables as compared with adulthood Zn or PQ alone intoxicated animals. The results demonstrate that postnatal Zn/PQ intoxication dents the oxidative stress,



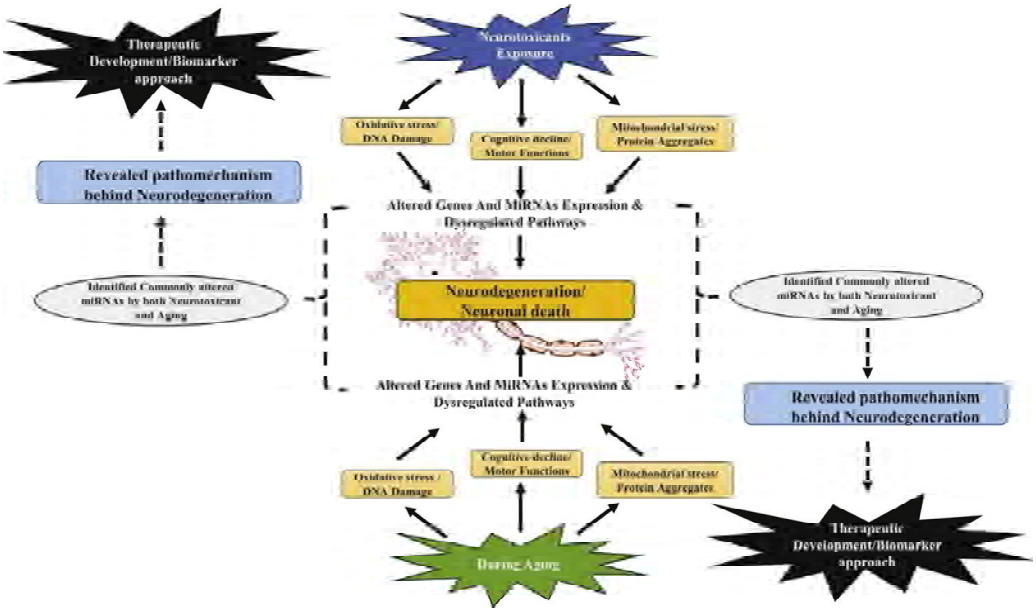
Effect of Zn/PQ on procaspase 3/9 protein levels in nigrostriatal tissues of animals treated during postnatal days and/or during adulthood. Data are expressed as mean ± SEM (n = 4). (C = control group; Zn(A) = Zn exposure during adulthood; PQ(A) = PQ exposure during adulthood; Zn(PN)+Veh = Zn treatment during postnatal days and vehicle during adulthood; Zn(PN)+Zn(A) = Zn exposure during postnatal days and adulthood; Zn(PN)+PQ(A) = Zn exposure during postnatal days + PQ exposure during adulthood; PQ(PN)+Veh = PQ exposure during postnatal days and vehicle during adulthood; PQ(PN)+Zn(A) = PQ exposure during postnatal days + Zn exposure during adulthood; PQ(PN)+PQ(A) = PQ exposure during postnatal days and adulthood). (*** = p<0.001 denotes comparison with control group; ### = p<0.001 and # = p<0.05 denote comparison with group exposed to Zn during adulthood only; $$$ = p<0.001 and $$= p<0.01 denote comparison with group exposed to PQ during adulthood only).

inflammation, cell death and dopamine metabolism and storage regulating machineries, which speed up the toxicant-induced degeneration during adulthood.

Mittra N, Chauhan AK, Singh G, Patel DK, Singh C (2020) Molecular Cell Biochemistry, 467: 27-43.

Role of microRNAs in neurodegeneration induced by environmental neurotoxicants and aging

The progressive loss of neuronal structure and functions resulting in the death of neurons is considered as neurodegeneration. Environmental toxicants induced degeneration of neurons is accelerated with aging. In adult brains, most of the neurons are post-mitotic, and their loss results in the development of diseases like amyotrophic lateral sclerosis (ALS), Parkinson's disease (PD), Alzheimer's disease (AD), and Huntington's disease (HD). Neurodegenerative diseases have several similarities at the sub-cellular and molecular levels, such as synaptic degeneration, oxidative stress, inflammation, and cognitive decline, which are also known in brain aging. Identification of these similarities at the molecular level offers hope for the development of new therapeutics to ameliorate all neurodegenerative diseases simultaneously. Aging is known as the most strongly associated additive factor in the pathogenesis of neurodegenerative diseases. Studies carried out so far identified several genes, which are responsible for selective degeneration of neurons in different neurodegenerative diseases. Countless efforts have been made in identifying therapeutics for neurodegenerative diseases; however, the discovery of effective therapy remains elusive. Findings made in the last two decades identified microRNAs (miRNAs) as the most potent post-transcription regulatory RNA molecule, which can condition protein levels in the cell and tissue-specific manner. Identification of miRNAs, which regulate both neurotoxicant and aging-associated degeneration of brain cells, raises the possibility that roads leading to aging and



Schematic representation of miRNAs as an important mechanistic link between aging & neurotoxicity and their use for potential therapy

neurotoxicant induced neurodegeneration cross at some point. Identification of miRNAs, which are common to aging and neurotoxicant induced neurodegeneration, will help in understanding the complex mechanism of neurodegenerative disease development. In the future, the use of natural miRNAs *in vivo* in therapy will be able to tackle several issues of aging and neurodegeneration. This review provided a summary of findings made on the role of miRNAs in neurodegeneration and explored the common link made by miRNAs between aging and neurotoxicants induced neurodegeneration.

Singh Tanisha, Yadav S (2020) Ageing Research Reviews, 60: 101068.

A combined microRNA and proteome profiling to investigate the effect of ZnO nanoparticles on neuronal cells

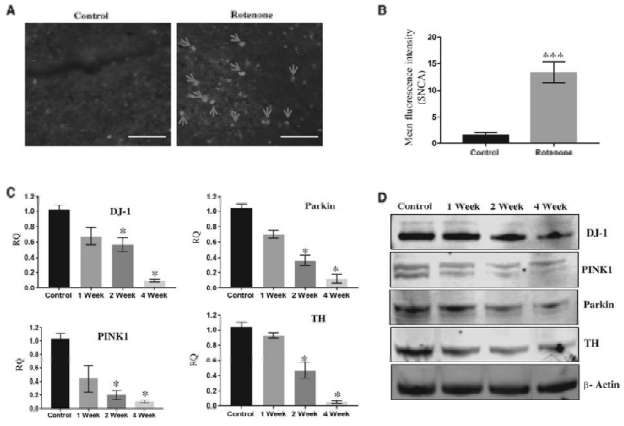
Zinc oxide nanoparticles (ZnO NPs) are one of the most broadly used engineered nanomaterials. The toxicity potential of ZnO NPs has been explored in several studies; however, its neurotoxicity, especially its molecular mechanism, has not been studied in depth. In this study, authors have used a cellular model of neuronal differentiation (nerve growth factor differentiated PC12 cells) to compare the effect of ZnO NPs exposure on neuronal (differentiated or mature neurons) and non-neuronal (undifferentiated) cells. Studies have shown that the noncytotoxic concentration of ZnO NPs causes neurite shortening and degeneration in differentiated PC12 cells. Brain-specific microRNA (miRNA) array and liquid chromatography with tandem mass spectrometry (LC-MS/MS) are used to carry out profiling of miRNAs and proteins in PC12 cells exposed with ZnO NPs. Exposure of ZnO NPs produced significant deregulation of a higher number of miRNAs (15) and proteins (267) in neuronal cells in comparison to miRNAs (8) and proteins (207) of non-neuronal cells (8). *In silico* pathway analysis of miRNAs and proteins deregulated in ZnO NPs exposed differentiated PC12 cells have shown pathways leading to neurodegenerative diseases and mitochondrial dysfunctions are primarily targeted pathways. Further, a bioenergetics study carried out using Seahorse XFp metabolic flux analyzer has confirmed the involvement of mitochondrial dysfunctions in ZnO NPs exposed differentiated PC12 cells. In conclusion, differentiated PC12 cells (neuronal) were found more vulnerable than undifferentiated (non-neuronal PC12 cells) toward the exposure of ZnO NPs and deregulation of miRNAs and mitochondrial dysfunctions play a significant role in its toxicity.

Srivastava AK, Yadav SS, Mishra S, Yadav SK, Parmar D, Yadav S (2020) Nanotoxicology (https://doi.org/10.1080/17435390.2020.1759726)

Coordinated action of miR-146a and Parkin gene regulate Rotenone-induced neurodegeneration

Mitochondrial dysfunction is a common cause in pathophysiology of different neurodegenerative diseases. Elimination of dysfunctional and damaged mitochondria is a key requirement for maintaining homeostasis and bioenergetics of degenerating neurons. Using global microRNA (miRNA) profiling in a systemic rotenone model of Parkinson's disease, authors have identified miR-146a as upmost-regulated miRNA, which is known as inflammation regulatory miRNA. Here, they report the role of activated nuclear factor kappa beta (NF-kβ) in miR-146a-mediated downregulation of Parkin protein, which inhibits clearance of damaged mitochondria and induces neurodegeneration. Studies have shown that 4-week rotenone exposure (2.5 mg/kg b.wt) induced oxidative imbalance-mediated NF-kβ activation in 1 year old rat's brain. Activated NF-kβ binds in promoter region of miR-146a gene and induces its transcription, which downregulates levels of Parkin protein. Decreased amount of Parkin protein results in accumulation of damaged and dysfunctional mitochondria, which further promotes the generation of reactive oxygen species in degenerating neurons. In conclusion, these studies have identified direct role of NF-kβ-mediated upregulation of miR-146a in regulating mitophagy through inhibition of the Parkin gene.

Jauhari A, Singh T, Mishra S, Shankar J, Yadav S (2020) Toxicological Sciences, 176: 433–445.



Rotenone exposure induced Parkinson's disease like cellular and molecular alterations in aged rat brains. (A) Images and (B) bar graph of immunohistochemical analysis of SNCA accumulation in substantia nigra (SN) of control or 4-week rotenone exposed 1 year old rats. Scale bar 25 µM. C, Real-time PCR-based relative quantification (RQ) of mRNA of DJ-1, PINK1, Parkin, and tyrosine hydroxylase (TH) in total RNA isolated from SN of control or 1-, 2-, and 4-week rotenone exposed rats. D, Western blots of DJ-1, PINK1, Parkin, TH, and â-Actin in SN of control or 1-, 2-, and 4-week rotenone exposed rats. Rotenone 2.5 mg/kg b.wt 6 days in a week in 1 year old rats. Student's *t* test was performed to calculate significance. Mean fluorescence intensity was calculated using ImageJ, HPRT was used as normalization control for real-time PCR. $*p < .05$, $***p < .001$.

Oxidative stress–mediated photoactivation of carbazole inhibits human skin cell physiology

Prolonged exposure of the earth's surface to the sun's ultraviolet radiation may result in various skin diseases and cataract. Carbazole (CBZ), as a polycyclic aromatic hydrocarbon (PAH), is blended with a five member nitrogen containing ring. It is found in cigarette smoke, coal, eye kohl, tattoo ink, and wood combustion and affects various types of flora and fauna. Authors findings suggest that CBZ generates reactive oxygen species (ROS) like $O_2^{\cdot-}$ through type I photodynamic reaction and causes phototoxicity in the human keratinocyte cell line (HaCaT), which has been proved by mitochondrial dehydrogenase and neutral red uptake assays. CBZ induces single strand DNA damage. They have investigated the involvement of the apoptotic pattern of cell death and confirmed it by cytochrome C release from mitochondria and caspase 9 activation. Similarly, photo micronuclei formation was associated to CBZ induced phototoxicity. The results of this study strongly support that the upregulation of bax, cyto C, apaf 1, casp 9 and down regulation of bcl2, keap 1, nrf 2, and hmox 1 genes cause apoptotic cell death. Downregulation of antioxidant genes showed a significant amount of ROS generation by photosensitized CBZ. Therefore, the current study will be a step forward to safeguard human beings from sunlight induced photosensitive CBZ prolonged exposure.

Srivastav AK, Dubey D, Chopra D, Singh J, Negi S, Mujtaba SF, Dwivedi A, Ray RS (2020) Journal of Cellular Biochemistry,121: 1273-1282.

Research Output Indicators

Research Publications

Total publication	75
Average impact factor	5.97
IF NA	06
IF<3	12
IF 3-5	23
IF 5-7	13
IF 7-12	18
IF > 12	02
IF> 40	01

1. Abhishek A, Ansari NG, Singh V, Sinha RJ, Mishra P, Mishra A. (2020). Genetic susceptibility of CYP1A1 gene and risk of pesticide exposure in prostate cancer. Cancer Biomarkers. doi: 10.3233/CBM-190636
2. Abraham A, Mathew AK, Park H, Choi O, Sindhu R, Binod P, Pandey A, Park JH, Sang BI. (2020). Pretreatment strategies for enhanced biogas production from lignocellulosic biomass. Bioresource Technology, 301: 122725.
3. Abraham A, Moideen SK, Mathew AK, Athira Raj SR, Sindhu R, Pandey A, Byoung-In Sang, Sukumaran RK. (2020). Fumaric acid production from sugarcane trash hydrolysate using *Rhizopus oryzae* NIIST1. Indian Journal of Experimental Biology, 58: 548-556.
4. Ahmad A, Khan N, Giri BS, Chowdhary P, Chaturvedi P. (2020). Removal of methylene blue dye using rice husk, cow dung and sludge biochar: Characterization, application and kinetic studies. Bioresource Technology, 306: 123202.
5. Amobonye A, Bhagwat P, Pandey A, Singh S, Pillai S., (2020). Biotechnological potential of *Beauveria bassiana* as a source of novel biocatalysts and metabolites. Critical Reviews in Biotechnology, 40: 1019-1034.
6. Amon JD, Yadav AK, Ramirez-Guadiana FH, Meeske AJ, Cava F, Rudner D Z. (2020). SwsB and SafA are required for CwlJ-dependent spore germination in *Bacillus subtilis*. Journal of Bacteriology, 202: e00668-19
7. Anand SK, Sharma A, Singh N, Kakkar P. (2020). Activation of autophagic flux via LKB1/AMPK/mTOR axis against xenoestrogen Bisphenol-A exposure in primary rat hepatocytes, Food and Chemical Toxicology, 141: 111314.
8. Ananda SK, Sharma A, Singh N, Kakkar P. (2020). Entrenching role of cell cycle checkpoints and autophagy for maintenance of genomic integrity. DNA Repair, 86:102748
9. Arun KB, Madhavan A, Sindhu R, Binod P, Pandey A, Reshmy R Sirohi R. (2020). Remodeling agro-industrial and food wastes into value-added bioactives and biopolymers. Industrial Crops and Products, 154:112621.
10. Awasthi MK, Duan Y, Awasthi SK, Liu T, Chen H, Pandey A, Zhang Z, Taherzadeh MJ. (2020). Emerging applications of biochar: Improving pig manure composting and attenuation of heavy metal mobility in mature compost. Journal of Hazardous Materials, 389: 122116.
11. Awasthi MK, Ravindran B, Sarsaiya S, Chen H, Wainaina S, Singh E, Liu T, Kumar S, Pandey A, Singh L, Zhang Z. (2020). Metagenomics for taxonomy profiling: Tools and approaches. Bioengineered, 11: 356-374
12. Awasthi MK, Sarsaiya S, Patel AK, Juneja A, Singh RP, Yan B, Awasthi SK, Jain A, Liu T, Duan Y, Pandey A, Zhang Z, Taherzadeh MJ. (2020). Refining biomass residues for sustainable energy and bio-products: An assessment of technology, its importance, and strategic applications in circular bio-economy. Renewable and Sustainable Energy Reviews, 127:109876.
13. Awasthi Ml, Liu T, Awasthi SK, Duan Y, Pandey A, Zhang Z. (2020). Manure pretreatments with black soldier fly *Hermetia illucens* L. (Diptera: Stratiomyidae): A study to reduce pathogen content. Science of the Total Environment, 737: 139841.

14. Bharathiraja B, Iyyappan J, Jayamuthunagai J, Kumar RP, Sirohi R, Gnansounou E, Pandey A. (2020). Critical review on bioconversion of winery wastes into value-added products. Industrial Crops and Products, 158: 112954.

15. Bharathiraja B, Selvakumari IAE, Jayamuthunagai J, Kumar RP, Varjani S, Pandey A, Gnansounou E. (2020). Biochemical conversion of biodiesel by-product into malic acid: A way towards sustainability. Science of the Total Environment, 709: 136206.

16. Chaturvedi P, Chaurasia D, Pandey A, Gupta, P. (2020). Co-occurrence of multidrug resistance, β-lactamase and plasmid mediated AmpC genes in bacteria isolated from river Ganga, northern India. Environmental Pollution, 267: 115502.

17. Chen H, Awasthi SK, Liu T, Duan Y, Ren X, Zhang ZQ, Pandey A, Awasthi MK. (2020). Effects of microbial culture and chicken manure biochar on compost maturity and greenhouse gas emissions during chicken manure composting. Journal of Hazardous Materials, 389: 121908.

18. Chowdhary P, Sammi SR, Pandey R, Kaithwas G, Raj A, Singh J, Bharagava RN. (2020). Bacterial degradation of distillery wastewater pollutants and their metabolites characterization and its toxicity evaluation by using *Caenorhabditis elegans* as terrestrial test models. Chemosphere, 261:127689.

19. Duan Y, Awasthi SK, Liu T, Pandey A, Zhang Z, Kumar S, Awasthi MK. (2020). Succession of keratin-degrading bacteria and associated health risks during pig manure composting. Journal of Cleaner Production, 258: 120624.

20. Duan Y, Pandey A, Zhang Z, Awasthi MK, Bhatia SK, Taherzadeh MJ. (2020). Organic solid waste biorefinery: Sustainable strategy for emerging circular bioeconomy in China. Industrial Crops and Products, 153: 112568.

21. Gaur VK, Tripathi V, Gupta P, Dhiman N, Regar RK, Gautam K, Srivastava JK, Patnaik S, Patel DK, Manickam N. (2020). Bioresource Technology, 307: 123206.

22. Gaur, VK, Sharma P, Sirohi R, Awasthi MK, Dussap, CG, Pandey A. (2020). Assessing the impact of industrial waste on environment and mitigation strategies: A comprehensive review. Journal of Hazardous Materials, 398: 123019.

23. Hazeena SH, Sindhu R, Pandey A, Binod P. (2020). Lignocellulosic bio-refinery approach for microbial 2,3-Butanediol production. Bioresource Technology, 302: 122873.

24. Jagdale PR, Indradev, Ayanur A, Singh, D, Md Arshad, Ansari KM. (2020). Safety evaluation of ochratoxin A and citrinin after 28 days repeated dose oral exposure to Wistar rats. Regulatory Toxicology and Pharmacology, 115: 104700

25. Jauhari A, Singh T, Mishra S, Shankar J, Yadav S. (2020). Coordinated action of miR-146a and Parkin gene regulate Rotenone-induced neurodegeneration. Toxicological Sciences, 176: 433–445.

26. Kar AK, Singh A, Dhiman N, Purohit MP, Jagdale P, Kamthan M, Singh D, Kumar M, Ghosh D, Patnaik S. (2019). Polymer assisted *in situ* synthesis of silver nanoparticles with epigallocatechin gallate (EGCG) impregnated wound patch potentiate controlled inflammatory responses for brisk wound healing. International Journal of Nanomedicine, 14: 9837-9854.

27. Karsauliya K, Sonker AK, Bhateria M, Taneja I, Srivastava A, Sharma M, Singh SP. (2020). Metabolism, reaction phenotyping, plasma protein binding and toxicokinetic studies of fenarimol in rats at NOAEL dose. Xenobiotica. doi: 10.1080/00498254.2020.1796170.

28. Khan N, Chowdhary P, Ahmad A, Giri BS, Chaturvedi P. (2020). Hydrothermal liquefaction of rice husk and cow dung in Mixed-Bed-Rotating Pyrolyzer and application of biochar for dye removal. Bioresource Technology, 309: 123294.

29. Krishnamoorthy J, Mathew A, Valappil PK, Adarsh VP, Puthiyamadam A, Pandey A, Sukumaran RK. (2020). Ethanol production by a filamentous fungal strain *Byssochlamys fulva* AM130 under alternating aerobic and oxygen limited conditions, Systems Microbiology and Bioengineering,doi: 10.1007/s43393-020-00010-y

30. Kumar A, Das N, Satija NK, Mandrah K, Roy SK, Rayavarapu RG. (2020). A novel approach towards synthesis and characterization of non-cytotoxic gold nanoparticles using taurine as capping agent. Nanomaterials, 10: 45.

31. Kumar H, Chattopadhyay S, Das N, Shree S, Patel D, Mohapatra J, Gurjar A, Kushwaha S, Singh AK, Dubey S, Lata K, Kushwaha R, Mohammed R, Ghosh Dastidar K, Yadav N, Vishwakarma AL, Gayen JR, Bandyopadhyay S, Chatterjee A, Jain MR, Tripathi AK, Trivedi AK, Chattopadhyay N, Ramachandran R, Sanyal S. (2020). Leprosy drug clofazimine activates peroxisome proliferator-activated receptor-γ and synergizes with imatinib to inhibit chronic myeloid leukemia cells. Hematologica, 105: 971-986.

32. Kumar M, Rathour R, Singh R, Sun Y, Pandey A, Gnansounou E, Lin KA, Tsang DCW, Thakur IS. (2020). Bacterial polyhydroxyalkanoates: Opportunities, challenges, and prospects. Journal of Cleaner Production, 263: 121500

33. Kumar M, SrivastavaAK, Parmar D. (2020). Genetic analysis and epistatic interaction association of lipid traits in a C57xBalb/c F2 mice. Gene Reports, 20: 100729

34. Kumar M, Sun Y, Rathour R, Pandey A, Thakur IS, Tsang DCW. (2020). Algae as potential feedstock for the production of biofuels and value-added products: Opportunities and challenges. Science of theTotal Environment, 716: 137116.

35. Kumar M, Xiong X, Sun Y, Yu IKM, Tsang DCW, Hou D, Gupta J, Bhaskar T, Pandey A. (2020). Critical review on biochar-supported catalysts for pollutant degradation and sustainable biorefinery. Advanced Sustainable Systems, doi.org/10.1002/adsu.201900149

36. Kumari M, Purohit M, Pahuja R, Patnaik S, Shukla Y, Kumar P, Gupta KC. (2019). Pro-inflammatory macrophage polarization enhances the anticancer efficacy of hydrazinocurcumin contained self-assembled galactomannan nanoparticles. Drug Delivery and Translational Research, 9: 1159-1188.

37. Local burden of disease educational attainment collaborators: Nicholas Graetz, Lauren Woyczynski,.... Chandrasekharan Nair Kesavachandran,..... Sanjay Zodpey, Emmanuela Gakidou, Simon I Hay (2020). Mapping disparities in education across low- and middle-income countries. Nature, 577: 235-238.

38. Mandrah K, Jain V, Ansari JA, Roy SK. (2020). Metabolomic perturbation precedes glycolytic dysfunction and procreates hyperglycemia in a rat model due to bisphenol S exposure. Environmental Toxicology and Pharmacology, 77: 103372.

39. Maurya R, Pandey AK. (2020). Importance of protozoa Tetrahymena in toxicological studies: A review. Science of The Total Environment, 741 :140058.

40. Mittra N, Chauhan AK, Singh G, Patel DK, Singh C. (2020). Postnatal zinc or paraquat administration increases paraquat or zincinduced loss of dopaminergic neurons: Insight into augmented neurodegeneration. Molecular Cell Biochemistry. 467: 27-43.

41. Nagar Y, Thakur RS, Parveen T, Patel DK, Ravi Ram K, Satish A. (2020). Toxicity assessment of parabens in *Caenorhabditis elegans*. Chemosphere, 246: 125730

42. Pandey R, Shukla P, B. Anjum, Himanshu, Gupta PK, Pal S, Arjaria N, Gupta K, Chattopadhyay N, Sinha RA, Bandyopadhyay S. (2020). Estrogen deficiency induces memory loss via altered hippocampal HB-EGF and autophagy; Journal of Endocrinology, 244: 53-70.

43. Rai A, Das M, Tripathi A. (2019). Occurrence and toxicity of a Fusarium mycotoxin, Zearalenone. Critical Reviews in Food Science and Nutrition. 26: 1-20

44. Rajesh RO, Godan TK, Sindhu R, Pandey A, Binod P. (2020). Bioengineering advancements, innovations and challenges on green synthesis of 2, 5-furan dicarboxylic acid. Bioengineered, 11: 19-38.

45. Rajpurohit CS , Kumar V, Cheffer A, Oliveira D, Ulrich H, Okamoto OK, Zatz M, Ansari UA, Khanna VK, Pant AB. (2020). Mechanistic insights of astrocyte-mediated hyperactive autophagy and loss of motor neuron function in SOD1L39R linked amyotrophic lateral sclerosis. Molecular Neurobiology, doi: 10.1007/s12035-020-02006-0.

46. Raju KSR, Rashid, M, Gundeti M, Taneja, I Malik, MY, Singh SK, Chaturvedi S, Challagundla M, Singh SP, Gayen JR, Wahajuddin M. (2019). LC-ESI-MS/MS method for the simultaneous determination of isoformononetin, daidzein, and equol in rat plasma: Application to a preclinical pharmacokinetic study. Journal of Chromatography B-Analytical technologies in the Biomedical and Life Sciences, doi:10.1016/j.jchromb.2019.121776

47. Rani L, Saini S, Shukla N, Chowdhuri DK, Gautam NK. (2020). High sucrose diet induces morphological, structural and functional impairments in the renal tubules of *Drosophila melanogaster*: A model for studying type-2 diabetes mediated renal tubular dysfunction. Insect Biochemistry and Molecular Biology, doi.org/10.1016/j.ibmb.2020.103441.

48. Ravi A, Gurunathan B, Rajendiran N, Varjani S, Gnansounou E, Pandey A, You S, Raman JK, Ramanujam P. (2020). Contemporary approaches towards augmentation of distinctive heterogeneous catalyst for sustainable biodiesel production. Environmental Technology and Innovation, 19: 100906.

49. Rebello S, Anoopkumar AN, Aneesh EM, Sindhu R, Binod P, Pandey A. (2020). Sustainability and life cycle assessments of lignocellulosic and algal pretreatments. Bioresource Technology, 301:122678.

50. Rene ER, Bhaskar T, Sang B, Khanal SK, Pandey A. (2020). Innovations in environmental bioprocesses for sustainable development. Environmental Science and Pollution Research, 27: 27169–27171

51. Saini S, Rani L, Shukla N, Banerjee M, Chowdhuri DK, Gautam NK. (2020). Development of a *Drosophila melanogaster* based model for the assessment of

cadmium and mercury mediated renal tubular toxicity. Ecotoxicology and Environmental Safety, 201: 110811

52. Sajna KV, Sukumaran RK, Gottumukkala LD, Sasidaran S, Pandey A. (2020). Functional evaluation of exopolysaccharide from *Pseudozyma* sp. NII 08165 revealed the potential thickening and emulsifying applicability. Indian Journal of Experimental Biology, 58: 539-547.

53. Sarkar A, Rawat N, Sachan N, Singh MP. (2019). Unequivocal biomarker for Parkinson's disease: A hunt that remains a pester. Neurotoxicology Research, 36: 627-644.

54. Shanmugam S, Hari A, Pandey A, Mathimani T, Oscar FL, Pugazhendhi A. (2020). Comprehensive review on the application of inorganic and organic nanoparticles for enhancing biohydrogen production, Fuel, 270:117453.

55. Sharma A, Anand SK, Singh N, Dwivedi UN, Kakkar P. (2020). Berbamine induced AMPK activation regulates mTOR/SREBP-1c axis and Nrf2/ARE pathway to allay lipid accumulation and oxidative stress in steatotic HepG2 cells. European Journal of Pharmacology, 882:173244.

56. Sharma N, Kumar J, Abedin MM, Sahoo DB, Pandey A, Rai AK, Singh SP. (2020). Metagenomics revealing molecular profiling of community structure and metabolic pathways in natural hot springs of the Sikkim Himalaya. BMC Microbiology, 20: 246.

57. Sharma P, Gaur VK, Kim SH, Pandey A. (2020). Microbial strategies for bio-transforming food waste into resources. Bioresource Technology, 299:, 122580.

58. Sharma P, Gaur VK, Sirohi R, Larroche C, Kim SH, Pandey A. (2020). Valorization of cashew nut processing residues for industrial applications. Industrial Crops and Products, 152: 112550.

59. Singh A, Dhiman N, Kar AK, Singh, D, Purohit MP, Ghosh D, Patnaik S. (2019). Advances in controlled release pesticide formulations: Prospects to safer integrated pest management and sustainable agriculture. Journal of Hazardous Materials, 385: 121525.

60. Singh AK, Yadav P, Bharagava RN, Saratale GD, Raj A. (2019). Biotransformation and cytotoxicity evaluation of kraft lignin degraded by ligninolytic *Serratia liquefaciens*. Frontier in Microbiology, doi.org/10.3389/fmicb.2019.02364.

61. Singh M, Srivastava A, Sharma YK, Singh S, Singh SP. (2020). Carbon nanofibers as an efficient DSPE sorbent for sample cleanup in QuEChERS method of multi-class pesticide residue analysis in high fat and low water commodities using GC-ECD. Microchimica Acta. doi: 10.1007/s00604-020-04464-8.

62. Singh RS, Chauhan K, Kaur K, Pandey A. (2020). Statistical optimization of solid-state fermentation for the production of fungal inulinase from apple pomace. Bioresource Technology Reports, 9: 100364.

63. Singh RS, Kaur N, Pandey A, Kennedy JF. (2020). Hyper-production of pullulan from de-oiled rice bran by *Aureobasidium pullulans* in a stirred tank reactor and its characterization. Bioresource Technology Reports, 11: 100494

64. Singh RS, Singh T, Pandey A. (2020). Fungal endoinulinase production from raw Asparagus inulin for the production of fructooligosaccharides. Bioresource Technology Reports, 10: 100417.

65. Singh T, Yadav S. (2020). Role of micro RNAs in neurodegeneration induced by environmental neurotoxicants and aging. Ageing Research Reviews, 60: 101068.

66. Singh VK, Arora D, Ansari MI, Sharma PK. (2019). Phytochemicals based chemopreventive and chemotherapeutic strategies and modern technologies to overcome limitations for better clinical applications. Phytotherapy Research, 33: 3064-3089.

67. Srivastav AK, Dubey D, Chopra D, Singh J, Negi S, Mujtaba SF, Dwivedi A, Ray RS. (2020). Oxidative stress–mediated photoactivation of carbazole inhibits human skin cell physiology. Journal of Cellular Biochemistry, 121: 1273-1282.

68. Srivastava AK, Yadav SS, Mishra S, Yadav SK, Parmar D, Yadav S (2020). A combined microRNA and proteome profiling to investigate the effect of ZnO nanoparticles on neuronal cells. Nanotoxicology doi.org/10.1080/17435390.2020.1759726.

69. Tandon A, Singh SJ, Gupta M, Singh N, Shankar J, Arjaria N, Goyal S, Chaturvedi RK. (2020). Notch pathway up-regulation via curcumin mitigates bisphenol-A (BPA) induced alterations in hippocampal oligodendrogenesis. Journal of Hazardous Material, 392: 122052.

70. Tripathi MK, Rasheed MSU, Mishra AK, Patel DK, Singh MP. (2020). Silymarin protects against impaired autophagy associated with 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine-induced Parkinsonism. Journal of Molecular Neuroscience, 70: 276-283.

71. Ummalyma SB, Sukumaran RK, Pandey A. (2020). Evaluation of freshwater microalgal isolates for growth and oil production in seawater medium. Waste and Biomass Valorisation, 11: 223-230.

72. Usmani Z, Sharma M, Karpichev Y, Pandey A, Kuhad RC, Bhat R, Poonia R, Aghbashlo M, Tabatabaei M, Gupta VK.(2020). Advancement in valorization technologies to improve utilization of bio-based waste in bioeconomy context. Renewable and Sustainable Energy Reviews, 131: 109965.

73. Varjani S, Pandey A, Upasani VN.(2020). Oilfield waste treatment using novel hydrocarbon utilizing bacterial consortium — A microcosm approach. Science of the Total Environment, 745: 141043.

74. Varjani S, Upasani VN, Pandey A. (2020). Bioremediation of oily sludge polluted soil employing a novel strain of *Pseudomonas aeruginosa* and phytotoxicity of petroleum hydrocarbons for seed germination. Science of the Total Environment, 737: 139766.

75. Yadav A, Seth B, Chaturvedi RK. (2020). Brain organoids: Tiny mirrors of human neurodevelopment and neurological disorders. Neuroscientist, doi: 10.1177/1073858420943192.

Books

1. Pandey A, Pant AB. (2020) Footprints of Toxicology in India (Text Book). Published by PharmaMed Press, Hyderabad., ISBN 978-9-38935-468-3.

2. Kumar A, Dhawan A (Editors) (2019) Nanoparticle–Protein Corona: Biophysics to Biology, ISBN 978-1-78801-391-8.

3. Pandey A. (Series Editor) (2020) Biomass, Biofuels, Biochemicals **In** Volume VIII, Advances in Enzymes Catalysis and Technologies. Editors: Singh SP, Pandey A, Singhania RR, Larroche C, Li Z. Elsevier, Amsterdam, Netherlands; p 457 ISBN- 978-0-12-819820-9.

4. Bhaskar T, Pandey A, Raj E, Tsang D. (2020) Waste Biorefinery: Integrating Biorefineries for Waste Valorisation, Volume 2, Elsevier, Amsterdam, Netherlands, p 734 ISBN- 978-0-12-818228-4.

5. Pandey A. (Series Editor) (2020) Current Developments in Biotechnology and Bioengineering. In Volume XIX, Advanced Membrane Separation Processes for Sustainable Water and Wastewater Management – Aerobic Membrane Bioreactor Processes and Technologies Editors: Mannina G., Pandey A., Larroche C., Ng HY, Ngo HH (editors) (2020). Elsevier, Amsterdam, Netherlands; p 512 ISBN- 978-0-12819854-4.

6. Pandey A. Series (2020) Current Developments in Biotechnology and Bioengineering. In Volume XVIII, Series Editor- Ashok Pandey, Advanced Membrane Separation Processes for Sustainable Water and Wastewater Management – Aerobic Membrane Bioreactor Processes and Technologies, Editors : Ng HY, Ng TC, Ngo HH, Mannina G., Pandey A. Elsevier, Amsterdam, Netherlands; p 301 ISBN- 978-0-12-819809-4.

7. Pandey A. (Series Editor) (2020) Current Developments in Biotechnology and Bioengineering **In** Volume XVII Advanced Membrane Separation Processes for Sustainable Water and Wastewater Management – Anaerobic Membrane Bioreactor Processes and Technologies. Editors: Ngo HH, Guo W, Ng HY, Mannina G, Pandey A (2020)., Elsevier, Amsterdam, Netherlands; p 362 ISBN-978-0-12819852-0

8. Pandey A. (Series Editor) (2020) Current Developments in Biotechnology and Bioengineering **In** Volume XVI, Emerging Organic Micro-pollutants, Editors: Varjani D, Pandey A, Tyagi RD, Ngo HH, Larroche C. Elsevier, Amsterdam, Netherlands; p 565 ISBN- 978-0-12819594-9.

9. Pandey A. (Series Editor) (2020) Current Developments in Biotechnology and Bioengineering **In** Volume XV, Environmental and Health Impact of Hospital Wastewater, Editors: Tyagi RD, Sellamuthu B, Tiwari B, Song Y, Drougi P, Zhang X, Pandey A, Elsevier, Amsterdam, Netherlands; p 612 ISBN-978-0-1281-9722-0.

10. Pandey A. (Series Editor) (2020) Current Developments in Biotechnology and Bioengineering **In** Volume XIV, Sustainable Bioresources for Emerging Bioeconomy, Editors: Kataki R, Pandey A, Khanal SK, Pant D, Elsevier, Amsterdam, Netherlands; p 519 ISBN: 978-0-444-64309-4

11. Chowdhary P and Raj A (Editors) (2020) Contaminants and Clean Technologies. CRC Press, Taylor & Francis Group. ISBN 9780367225995.

12. Chowdhary P and Raj A Singh D, Akhtar Y (Editors) (2020). Microorganisms for Sustainable Environment and Health. Elsevier. ISBN: 0128190019, 9780128190012.

Book chapters

1. Chopra D, Kumar D, Dubey D, Singh J, Srivastav AK and Gupta KC. (2019). UVR and vitamin D synthesis **In** Skin Aging & Cancer: Ambient UV-R exposure, Editors: Dwivedi A, Agarwal N, Ray L, Tripathi, AK. Springer, Singapore, ISBN 978-981-13-2541-0.

2. Dhiman N, Singh A, Kar AK, Purohit MP, Patnaik S. (2020). Comprehensive array of ample analytical strategies for characterization of nanomaterials **In** Functionalized Nanomaterials Fabrications. Editors:

Kumar V, Guleria P, Dasgupta N, Ranjan S, 2020, CRC Press, ISBN 978-1-35102-162-3.

3. Dubey K, Lugun O, Pandey AK. (2019). Impact of nanoparticle–protein interactions on biological assays. **In:** Nanoparticle–Protein Corona: Biophysics to Biology, Editors: Kumar A, Dhawan A. ISBN 978-1-78801-391-8.

4. Gautam K and Anbumani S. (2020). Ecotoxicological effects of organic micro-pollutants on the environment **In:** Current Developments in Biotechnology and Bioengineering, Editors: Varjani S, Tyagi RD, Larroche C, Pandey A, Ngo HN. Elsevier, Page. 481-501, ISBN: 978-0-12-819594-9.

5. Gautam K, Dwivedi S, and Anbumani S. (2020). Microplastics in biota **In:** Handbook of Microplastics in the Environment, Editors: Rocha-Santos T, Costa M, Mouneyrac C. Springer Nature Switzerland AG, Page 1-23, ISBN: 978-3-030-10618-8.

6. Gautam K, Dwivedi S, Singh D, Anbumani S. (2020). Breasts and birth control implant **In:** "Toxicological Aspects of Medical Device Implants", Editors: Srinivasan P, Shanmugam T, Chokkalingam L, Bakthavachalam P. Acadamic Press, Elsevier, Page 135-157, ISBN: 9780128209202.

7. Maurya A and Raj A. (2020). Recent advances in application of biofilm in bioremediation of industrial wastewater and organic pollutants. **In:** Microorganisms for sustainable in environment and health. Elsevier. Page. 81-118. ISBN: 978-0-12-819001-2.

8. Ravi Ram K and Chowdhuri DK. (2020). Drosophila: A model for Biotechnologists. **In:** "Animal Biotechnology: models in discovery and translation", Editors: Singh A and Verma AS, Academic Press, USA, ISBN: 978-0-12-811710-1

9. Sharma VP, M Abid and MM Abid Ali Khan (2020). Climate change and potential environmental implications **In:** Environmental Change and Impact on Biological Systems, Lenin Media Private Limited Delhi, India, Page 128-142, ISBN 978-93-85995-16-3

10. Sharma VP, Sharma P.(2020). Environmental contaminants: Treatment, threats, toxicity and tools for sustainability **In:** Waste Water Treatment-Cutting edge Molecular Tools,Techniques, and Applied Aspects Editors: Shah MP, Sarkar A, Mandal S, Elsevier Inc USA, ISBN: 978-12-8218881-5,

11. Sharma VP.(2019). Plastics and polymeric products-Environmental toxicological aspects, challenges and future strategic interventions **In:** Environmental Toxicology and Bioremediation, Editors: Mahdi AA, Abid M, Abid Ali Khan MM, Verma D, Maheswari RK, Discovery Publishing House, New Delhi, Page 97-109, ISBN: 978-93-86841-83-4.

12. Sharma VP.(2020). Polymers and microplastics: Implications on our Environment and Sustainability **In:** Emerging Technologies, Environment and Research for Sustainable Agriculture, published by Intechopen Limited 10 Lower Thames Street London ECR3R 6AF,UK ISBN 978-1-83881-200-3

13. Singh AK, Raj A. (2020). *In silico* bioremediation strategies for removal of environmental pollutants released from paper mills using bacterial ligninolytic enzymes. **In:** Microorganisms for sustainable in environment and health. Elsevier. Page. 249-279. ISBN: 978-0-12-819001-2.

14. Singh AK, Raj A. (2020). Toxicity evaluation of paper mill pollutants using *In Silico* toxicology approach for environment safety. **In:** Contaminants and Clean Technologies. CRC Press, Taylor & Francis Group. 2020, Page. 54-65, ISBN 978-0-36-722599-5.

15. Singh VK and Sharma PK. (2020). Oxidative Stress and Lifestyle-based Changes in Breast Cancer Progression **In:** Current Advances in Breast Cancer Research: A Molecular Approach, Editors: Shankar S, Garima S, Sanjay M, ISBN: 978-981-14-5142-3

16. Srivastava A, Singh M., Singh S., Singh S.P. (2020) Recent Advances in Micro-extraction Based Analytical Approaches for Pesticides Analysis in Environmental Samples. **In:** Measurement, Analysis and Remediation of Environmental Pollutants. Energy, Environment, and Sustainability. Editors: Gupta T., Singh S., Rajput P., Agarwal A. Springer, Singapore. ISBN: 978-981-15-0539-3-9-14

Copyrights filed in India

S. No	Title	Inventors	Filing date	Application number
1	Oneer	Alok Dhawan, KC Khulbe, RC Murthy, Ali Kausar	25-Feb-20	023/CR/2020
2	Transforming lives through Research & Innovation	Alok Dhawan	18-Feb-20	014/CR/2020

Patents filed in India (2019-20)

S.No	Title	Inventors	Filing Date	Application No.
1	An apparatus for staining and immunolabeling of biomolecules on gels, membranes, slides or similar surface in cool mist phase	Sanjay Yadav Sana Sarkar Nishant Singh Abhishek Mishra	22-Aug-19	201911033775
2	A Novel process and Product thereof for the detection of Argemone in edible oils	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	9-Oct-19	0172NF2019
3	A chemical process for detection of Cyanide in Aqueous Solutions	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	6-Nov-19	0197NF2019
4	A chemical composition for detection of furfural and hydroxymethylfurfural in food commodities and process for detection thereof	Srishti Mehrotra Pawan Kumar Rai Sandeep Kumar Sharma	4-Dec-19	201911049845
5	A novel method and the product thereof for the Detection of Polyphenols	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	17-Dec-19	0225NF2019
6	Processing and instrumentation for Solid Phase Extraction (SPE)	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	29-Jan-20	0020NF2020
7	A process for detection of ammonia and ammonium compounds in aqueous sample and product thereof	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	7-Feb-20	0024NF2020
8	A process for detection of formalin in aqueous sample and product thereof	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	11-Feb-20	0027NF2020
9	Device and technique for air quality monitoring and management	Abhishek Mishra Ramakrishnan Parthasarathi Alok Dhawan	15-May-20	0065NF2020
10	A novel process and product thereof for the detection of butter yellow in edible oils	Sandeep K Sharma Pawan Kumar Rai Srishti Mehrotra	15-May-20	0061NF2020
11	A novel process and product thereof for the detection of Karanja oil in edible oils	Sandeep Kumar Sharma Pawan Kumar Rai Srishti Mehrotra	15-May-20	0064NF2020
12	A process for detection of hydrogen peroxide in aqueous medium and product thereof	Pawan Kumar Rai Srishti Mehrotra Sandeep Kumar Sharma	15-May-20	0063NF2020
13	A ready to use test strip for the rapid detection of polyphenols and use thereof	Pawan Kumar Rai, Srishti Mehrotra, Sandeep Kumar Sharma	9-Jun-20	202011024280
14	A test strip for the rapid detection of nitrate and nitrite in aqueous medium and use thereof	Pawan Kumar Rai, Srishti Mehrotra, Sandeep Kumar Sharma	29-Jun-20	202011027503

PhD Awarded

Name	Year	Supervisor	University	Title	Stream
Anurag Kumar Srivastava 	2019	Dr Mahadeo Kumar, Senior Scientist	Amity University, Lucknow	Zinc oxide nanoparticles and their toxicological effects in mouse model	Biotechnology
Himanshu P Gupta 	2019	Ravi Ram Kristipati, Principal Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Drosophila based studies towards understanding the link between xenobiotic exposure and diabetes	Biological Sciences
Ankita Rai 	2019	Dr Anurag Tripathi, Senior Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Studies on dermal toxic potential of a mycotoxin, Zearalenone	Biological Sciences
Chetan Singh Rajpurohit 	2019	Dr AB Pant, Senior Principal Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Application of human iPSCs in deciphering the molecular insights of Amyotrophic Lateral Sclerosis and its association with early developmental stage.	Biological Sciences
Anshuman Srivastava 	2020	Dr Sheelendra Pratap Singh, Senior Scientist	Babu Banarasi Das University, Lucknow	Studies on determination of environmental contaminants by using different analytical techniques	Chemical Sciences
Yogendra Nagar 	2020	Dr Aruna Satish, Senior Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Toxicity evaluation of parabens in Caenorhabditis elegans	Biological Sciences
Mohd Sami Ur Rasheed 	2020	Dr Mahendra Pratap Singh, Senior Principal Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	A study on the role of Nrf2 in Cyp2d22- mediated neuroprotection against maneb- and paraquat- induced Parkinsonism	Biological Science
Manish Kumar Tripathi 	2020	Dr Mahendra Pratap Singh, Senior Principal Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	A study on the molecular mechanism of silymarin-mediated protection against MPTP-induced Parkinsonism: role of autophagy	Biological Science
Namrata Mittra 	2020	Dr Chetna Singh, Senior Principal Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Effect of developmental exposure to zinc or paraquat on adulthood re-exposure: Relevance to Parkinson's disease.	Biological Sciences

Ankita Srivastava 	2020	Dr Devendra Parmar, Chief Scientist Co-supervisor: Dr Vinay Kumar Khanna	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Effect of prenatal exposure of lindane during postnatal brain development in rat offspring and understanding their response when rechallenged at adulthood.	Biological Sciences
Ankur Srivastava 	2020	Dr Devendra Parmar, Chief Scientist Co-supervisor: Dr Sanjay Yadav, Senior Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Studies on Zinc Oxide (ZnO) nanoparticles induced alteration in adult and developing brain.	Biological Sciences
Sugandh 	2020	Dr Poonam Kakkar, Chief Scientist	Academy of Scientific and Innovative Research (AcSIR), Gaziabad	Studies on role of mitophagy in hyperglycemia induced nephrotoxicity.	Biological Sciences

Visits

	Dr Sandeep Kumar Sharma, Senior Scientist	Lausanne, Switzerland	October 1, to October 24, 2019	To attend conferences, symposium and to conduct research related meeting with Professor Edgard Ganan
	Ms Gayatri Bagree, (Research Scholar)	Australia	October 2019 to October 2021	AcSIR-RMIT Joint PhD program
	Dr Abhay Raj, Senior Scientist	South Korea	November 10 to November 14, 2019	To attend IBI Biochar World Congress-2019, Korea University, Seoul, Korea
	Mr Zeeshan Arif (Research Scholar)	RMIT Australia	November 2019 to November 2020	RMIT-AcSIR Joint PhD Program
	Dr Natesan Manickam, Chief Scientist	France	November 14 to November 15, 2019	To Participate in the Scientific Council Meeting of the Rovaltain Foundation in Valence, France
	Dr Pradeep Kumar Sharma Senior Scientist	California, USA	February 01 to October 31, 2020	Visit to Chemical and Biomolecular Engineering Department, University of California, USA under Long term ICMR-DHR International Fellowship 2019-20

Agreements and MoU

1. A MoU was signed between CSIR-IITR, Lucknow and Sree Chitra Tirunal Institute for Medical Sciences and Technology, Thiruvananthapuram on November 21, 2019 for extending and strengthening the functional relationships, and mutual sharing of facilities in the respective institutes.
2. An agreement was signed between CSIR-IITR, Lucknow and NBI Biosciences Pvt. Limited, Mehrauli, New Delhi on 17th December 2019 for development of inhibitor molecules from plant origin to the enzymes.
3. A MoU was signed between CSIR-IITR, Lucknow and FSSAI, New Delhi on 18th of December 2019 for the purpose of implementation of the scheme for up gradation of food testing system in Referral Food Laboratories.
4. A MoU was signed between CSIR-IITR, Lucknow and Ground Water Department, Uttar Pradesh on January 9, 2020 for the interest of public and mutual interest of both bodies.
5. A MoU was signed between CSIR-IITR, Lucknow and M/s Maithri Aquatech Private Ltd, Secunderabad on 3rd February 2020 for jointly conducting the R&D activities in the water sector.
6. A MoU was signed between CSIR-IITR, Lucknow and Great Eastern Medical School and Hospital (GEMS &H), Srikakulam on January 20, 2020 for joint project and publications, visits for research purposes, sample collection.
7. A MoU was signed between CSIR-IITR, Lucknow and IISc Bengaluru and IIT Guwahati, and IIT Kanpur and CIPET on December 17, 2019 for the development of new generation Acetabular Socket Liner and Femoral head Prototypes.
8. A MoU was signed between CSIR-IITR Lucknow and NBI Biosciences Pvt. Limited, Mehrauli, New Delhi on February 06, 2020 for the development work on enzymes.
9. A MoU was signed between CSIR-IITR, Lucknow and Dayalbagh Educational Institute (Deemed University), Dayalbagh, Agra on 17 February 2020 for long term collaboration in the areas of mutual interest.
10. A MoA was signed between CSIR-IITR, Lucknow between SS Maser Technology Private Limited, Lucknow on 12 March 2020 agreed to jointly perform R&D activities related to the "Microwave assisted cold sterilization based disinfection / sterilization device for PPE kits and N-95 Masks".
11. A MoU was signed between CSIR-IITR, Lucknow and CSIR-NPL, New Delhi on 13 March 2020 for development of Indian reference material for common pesticide as per Indian scenario.
12. A MoA was signed between CSIR-IITR, Lucknow and M/s ASPL Green Ventures (P) Limited, Lucknow on 30 March 2020 for jointly perform R&D activities related to the preparation of hand rub sanitizer.
13. A MoU was signed between CSIR-IITR, Lucknow and Lifecare Innovations Pvt. Ltd, New Delhi and SGPGIMS, Lucknow on 11 May 2020 for submitting a joint proposal to BIRAC for funding.
14. A collaboration agreement was signed between CSIR-IITR, Lucknow and CSIR-IIP, Dehradun and University of Glasgow, Glasgow and Gram Utthan, Bhubaneswar on 04 May 2020 to perform the project titled "Feasibility and impacts of Bioenergy Trigeneration systems (BioTrig) in disadvantaged rural areas in India" under the Global Challenges Research Fund, which has been approved by the Scottish Funding Council.
15. A Non-disclosure agreement was signed between M/s Yash Papers Limited, Ayodhya and CSIR-IITR, Lucknow on 30 June 2020 for the purpose of disclosing the Proprietary information includes all written and oral information, prints, drawings, knowledge, technology, Know-how, processes, plans, quotations, manufacturing formulas and other information whatsoever.
16. A MoU was signed between CSIR-IITR, Lucknow and KIET group of Institutions, Ghaziabad on 05 August 2020 for long term collaboration in the areas of mutual interest.
17. A MoU was signed between CSIR-IITR, Lucknow and Hindu College, University of Delhi, Delhi on 26 August 2020 to share mutually the existing facilities and available expertise of both the institutions.
18. A MoU was signed between CSIR-IITR, Lucknow and Integral University, Lucknow on 18 September 2020 for long term collaboration in the areas of mutual interest.
19. A MoU was signed between CSIR-IITR, Lucknow and National Institute of Pharmaceutical Education and Research, Hyderabad on 24 September 2020 for long term collaboration in the areas of mutual interest.

Externally Funded Projects

Title	Sponsor	Principal Investigator	Start date	Total Value (INR)
Isolation, synthesis and structure function analysis of frog and toad skin derived antimicrobial , anticancer and wound healing peptides	Deptt. of Biotechnology, New Delhi	Dr Neeraj Kumar Satija	October 24, 2019	3198240.00
Environmental monitoring at ITI Ltd., Mankapur	Environmental Management Deptt, ITI, Mankapur, Gonda	Er A.H. Khan	November 04, 2019	174640.00
Analysis of water and sludge sample for physicochemical, metals and bacteriological parameters	General Manager, Dudhichua Project, Northern Coalfields Ltd., P.O. Khadia, Distt. Sonebhadra	Dr DK Patel/ Dr S Patnaik	November 07, 2019	158120.00
Testing of parameter (Polluted water, ambient Air and stack of units) and collection of their samples from different places of OTPS, Obra, distt. Sonebhadra	Obra Thermal Power Project (UPRVNL) Obra, Distt. Sonebhadra	Er AH Khan	November 11, 2019	609000.00
Analyse the toxic chemicals and elements in the leachates of cigarette butts and bidi butts using TCLP method	Central Pollution Control Board, New Delhi (NGT)	Dr DK Patel	November 20, 2019	4800000.00
Analysis of heavy metals in samples moulded prepared using Zeocrete cement Additives + OPC Grd 43 cement	Zeocrete Technologies India LLP, UG-40, Ansals Chamber-II, 6 Bhikaji Cama Place, New Delhi	Dr DK Patel	December 03, 2019	118000.00
Analysis of Physiochemical parameters, bacteriological and metals in ground water samples	NTPC, Unchahar	Dr DK Patel/ Dr S Patnaik	December 30, 2019	249782.00
Network for Scientific cooperation for food safety and applied Nutrion (NETSCOFAN)	FSSAI, New Delhi	Dr KM Ansari	January 08, 2020	1000000.00
Procurement of services for ground water quality parameters testing and analysis through sample collected from Piezometers monitoring wells under Yamuna basin, central ganga basin and Ramgaya Basin of UP	Ground Water Department, UP, Lucknow	Ms Preeti Chaturvedi/ Dr KC Khulbe	January 15, 2020	14160000.00
Toxicity study of IICB-CM capsules as per DCGI guidelines	CSIR-IICB, Kolkata	Dr AB Pant	January 17, 2020	4802600.00
Harnessing the functional microbiome possessing metabolic potential to degrade micro pollutants for safeguarding the polluted marine ecosystem	Ministry of Earth Sciences, New Delhi	Dr N Manickam	January 23, 2020	2305000.00
Analysis of physico chemical parameters and metals in river water, Nala water and ground water samples.	Grasim Industries Limited, Renukoot	Dr DK Patel/ Dr S Patnaik	January 24, 2020	237600.00
Establishing Bio-Nest at CSIR-IITR	BIRAC, New Delhi	Professor Alok Dhawan	February 14, 2020	38660000.00
Testing of drinking water/ ground water from different places of OTPS, Obra	Obra Thermal Power project, UPRVUNL, Obra	Er AH Khan	March 02, 2020	198000.00
Novel efflux pump inhibitors for restoring E.coli sensitivity for antibiotics (NEPIRESA)	ICMR, New Delhi	Dr R Parthasarathi	March 25, 2020	1167200.00
भूजल संसाधन की गुणवत्ता के अनुश्रवण एवं मेपिंग की विश्लेषणात्मक रिपोर्ट हेतु भूजन नमूनों का विश्लेषण किया जाना	निदेशक, भूगर्भ जल विभाग, उ. प्र. 9वाँ तल, इन्दिरा भवन, अशोक मार्ग, लखनऊ	Ms Preeti Chaturvedi/ Dr KC Khulbe	June 05, 2020	16000000.00
Feasibility and Impact of Bioenergy Trigeneration systems(Bio Trig)in disadvantaged rural areas in India	University of Glasgow, Glasgow, Scotland	Ms Preeti Chaturvedi	June 15, 2020	643500.00
Analysis of metals and physicochemical parameters in LWTP sludge samples (4 nos.)	National thermal Power corporation, Vindya Nagar, Singrauli(M.P.)	Dr B Sreekanth	June 30, 2020	132000.00
Collection and analysis of inlet and treated effluent of STP, Ayodhya, Gorakhpur and Sultanpur Districts	Toshiba water solutions Pvt. Ltd., 3/1194 Vashundhra, Ghaziabad, UP	Ms Preeti Chaturvedi	July 15, 2020	1642560.00

Honours and Awards

Professor Alok Dhawan, Director 	2919-2020	• Professor S.S. Katiyar Endowment Lecture Award of ISCA conferred on 107th Indian Science Congress at Bangalore, 2020. • LMA Awards 2019, Lucknow Management Association, Lucknow. • Life time achievement award of the Society of Toxicology India, 2019.
Dr Natesan Manickam, Chief Scientist 	2019-2021	• Became International Scientific Council Member of Fondation Rovaltain, Valence, France
Dr AB Pant, Senior Principal Scientist 	2019 2019 2019 2019 2020	• Elected the Outreach Member of the Society of Quality Assurance, USA • Registered in the UK-Register of Toxicologists, by Royal Society of Biology and British Tox • Elected Member of Royal Society of Biology, London, UK • Elected Member of Federation of European Toxicologists and European Societies of Toxicology • Member, Microphysiology System (MPS) Summit Scientific Advisory Committee, USA
Dr Parthasarathi Ramakrishnan, Principal Scientist 	2020	• Member of Evaluator Team: Reviewed ideas submitted for Smart India Hackathon • Member of Evaluator Team:: Ideas evaluation for M/o MSME, Govt of India, Ideas For New India Challenge 2020 "Support for Entrepreneurial and Managerial Development of MSMEs through Incubators" Area Specialization: Healthcare & Lifesciences, Medical Devices, Pharmaceuticals, Biotech, AYUSH • Editorial Board Member of the Journal of Energy and Environmental Sustainability (http://www.jees.in/) and Journal of Environmental Science and Engineering (http://neerijese.org/) • Elected Member European Society of Toxicology (ESTIV) Europe and The Society of Toxicology (SOT), USA
Dr Abhay Raj, Senior Scientist 	2019	• Young Environmentalist Award for outstanding contribution in the field of environmental Science by Agro Environmental Development Society (UP) in 2019. • CSIR-Raman Research Fellowship (RRF)-awarded for the year 2019-2020, the collaborative research is to be undertaken at Korea University, Seoul.
Professor Ashok Pandey, Distinguished Scientist 	2020 2020 2020 2019 2019 2020	• **Top 21 Scientist No. 1 in Biotechnology field in India** • Fellow, Indian Chemical Society • Distinguished Scientist, 7th International Scientist Awards on Engineering, Science and Medicine. Coimbatore, India; VDGOOD Professional Association and 8th in world • Distinguished Professor of Eminence with global impact in the area of Biotechnology, Precious Cornerstone University, Ibadan, Nigeria. • Highest Cited Researcher (Top 1% in the world), Clarivate Analytics, Web of Science. • IconSWM Life-time Achievement Award, International Society for Solid Waste Management, KIIT, Bhubaneshwar, India (2019) • Visiting Professor, Universite Clermont Auvergne, France

Ms Snigdha Gupta, DST Inspire-SRF

2020 Toxikon, A Preclinical Toxicology Organization; and Dr Dharm Singh Association of Scientists of India

Mr Vivek Kumar Gaur CSIR-Senior Research Fellow

2019 Young Researcher Award for oral presentation

Ms Pooja Yadav, PA-II

2019 Best Poster Award

Ms Varsha Tripathi Project Fellow

2019 Research Excellence Award for poster presentation

Ms Payal Mandal, Research Associate

2019 Second Award, oral presentation

Ms Anima Kumari UGC-Senior Research Fellow

2020 DM Kar Prize for paper presentation in oral session

Ms Shweta Singh Chauhan Project Assistant

2019 Best Poster Award

Knowledge Resource Centre (KRC)

Knowledge Resource Centre (Library & Information Division) provides critical information and knowledge support to the Scientific & Technical staff, Research Fellows, Project Assistants and users from other organizations. CSIR-IITR KRC is a hub to access current literature in the discipline of toxicology and meets the requirements of the scientific fraternity.

Information Resources: Presently, CSIR-IITR KRC is having collection as under (As on 31.3.20):

i) Books (Includes PR Collection): 9014
ii) Hindi Books: 918
iii) Bound Volumes of Journals:14,440

During the year(19-20), the Centre acquired 28 books in Hindi.

Subscriptions: CSIR-IITR KRC is a member of National Knowledge Resource Consortium (NKRC) through which many common resources are accessible to our S&T staff. The following e-journal platforms are subscribed by the Centre and NKRC:

1. Science Direct/Elsevier: :i) Cell, ii) Free Radical Biology & Medicine iii) Toxicology iv) Toxicology Letters
2. Wiley Online: 252
3. Springer Online (Biomedical and Life Sciences ; Medicine): 400
4. Nature Online
5. OUP Online: i) Carcinogenesis, ii) Journal of Analytical Toxicology and iii) Toxicological Sciences
6. ACS : 59
7. RSC: 46
8. T&F: 2700
9. Science Online
10. Annual Reviews:
    i) Annual Reviews in Neurosciences,
    ii) Annual Reviews in Pharmacology & Toxicology.

Services: The services provided by the Centre are as under:

1) **Toxicology Updates:** Articles appearing in Nature & Science and news related to the subject are being sent to the scientific staff on regular basis through email.

2) **Online Document Search:** This service is provided through LIBSYS (Library Management Software) in which KRC staff does literature search for the scientists, research fellows & other users on the subject of their interest. This service is also available to the institutional staff who can search our collection using OPAC (Online Public Access Catalogue) over intranet.

3) **Reprography Service:** Photocopy of the articles, Project Reports and other scientific documents are provided to the users of the Institute.

4) **Newspaper Clippings:** 09 national newspapers are browsed for newspaper clipping service and relevant information is sent to the competent authority on daily basis.

5) **Plagiarism Detection Service(PDS):** The Centre provides plagiarism detection service using "Ithenticate" plagiarism tool.

6) **Document Delivery Service(DDS):** The Centre arranges articles from other Labs and Institutes for the Scientists and Research Scholars and also delivers the articles to other Labs and Institutes.

7) **Publication Information Service(PIS):** The Centre compiles publication information on calendar year basis.

8) **OPACs:** 02 OPACs (Online Public Access Catalogues) are active on the Intranet.
KOHA OPAC is available for browsing our Collection on the Internet. LibSys OPAC is active on the Intranet.

Accreditions

GLP Certified Services

सत्यमेव जयते

National Good Laboratory Practice (GLP) Compliance Monitoring Authority (NGCMA)
Department of Science and Technology
GOVERNMENT OF INDIA

Certificate of GLP Compliance

This is to certify that

GLP Test Facility, CSIR-Indian Institute of Toxicology Research
Gheru Campus, Sarojini Nagar Industrial Area, Kanpur Road
Lucknow – 226008, Uttar Pradesh (India)

is a GLP certified test facility in compliance with the NGCMA's Document No. GLP-101 "Terms & Conditions of NGCMA for obtaining and maintaining GLP certification by a test facility" and OECD Principles of GLP.

The test facility conducts the below-mentioned tests/ studies:

- **Toxicity Studies**
- **Mutagenicity Studies**
- **Environmental Toxicity Studies on Aquatic and Terrestrial Organisms**
- **Analytical and Clinical Chemistry Testing**

The specific areas of expertise, test items and test systems are listed in the annexure overleaf.

Validity: June 5, 2020 – June 4, 2023

Certificate No. : GLP/C-154/2020
Issue Date : 13-10-2020

(Dr. Neeraj Sharma)
Head, NGCMA

Certificate of GLP Compliance by NGCMA to CSIR-IITR

CSIR-IITR has been accredited by National GLP Compliance Monitoring Authority (NGCMA) since 2014 for toxicity studies. A number of studies, as desired by the sponsoring agencies, have been carried out. The certificate is valid till June 4, 2023.

Accreditions

FSSAI Certification

FSSAI certification to CSIR-IITR as the National Reference Laboratory

CSIR-IITR has been recognized by FSSAI as the National Reference Laboratory for Toxicological evaluation/risk assessment of neutraceuticals etc. for three years from August 08, 2019.

Research, Planning and Business Development

Research Planning and Business Development (RPBD) Division is the focal point to govern and project the overall activities of the institute by planning, monitoring and evaluating the in-house, networked and externally funded project activities. The division also explores the possibilities of business development by liaisoning with industries, private and public sector undertakings, government organizations, research institutions and universities. Other important activities of the division include:

- Interaction with International Scientific and Technology Affairs Directorate (ISTAD) of CSIR and other international and national agencies to organize visits of scientists under various bilateral exchange programmes.
- Preparation of annual future plan, policy and road maps, strategic business plan, etc. of the institute.
- Ensuring proper management of intellectual property in coordination with the scientists for identification of patentable content of the material and coordinating with Innovation Protection Unit (IPU) of CSIR.
- Sending replies to Parliament questions and preparation of audit replies.
- Rendering help for Research Council (RC) meeting, Management Council (MC) meeting and other activities related to extramural human resource development.
- Signing of MOUs/Agreements between the institute and outside parties.
- With respect to image management of institute, interaction with the media and issuing press notes during various institutional activities for effective science outreach.

Computer Centre

Computer Centre caters to the computational and ICT need of the staff and students of the institute engaged in R&D and S&T activities. The services provided by this centre include, software development, maintenance and troubleshoot of ICT infrastructures, such as Proxy, Gateway, SMTP, Antivirus, Active Directory Servers and Unified Threat Management device. Both campuses of the institute have campus-wide Local Area Network consisting of more than 350 nodes. The network infrastructure is built from the combination of optical fibre, UTP cables and switches. The internet access is provided through a gateway using 100 Mbps NKN and 20 Mbps (1:1) OFC links at the M.G. Marg Campus and 20 Mbps (1:1) OFC link at the Gheru Campus. Multilayered firewall, anti-spam, intrusion prevention system and antivirus solutions have been implemented for network security. Domain controller server is also configured and implemented for policy-based central management of computers within the institutional network.

Institutional bilingual Web Site, Intranet site, websites and web-based applications for all the major conferences and skill India initiative programmes organized by the institute were developed by the staff of this centre. The institute has its presence on the major social media platforms like Facebook, Twitter, Linkedin, WhatsApp and YouTube where current information on R&D activities, events and development are posted on a regular basis. Live posts on various events are posted on the above social media platforms. Live streaming of important events is also broadcasted in real-time. The staff of this centre continues to participate in the project "Toxicity testing: GLP test facility" and shares responsibilities related to Electronic Data Processing. The tasks performed by the division include document control and maintenance of hardware, software and network infrastructure available in GLP certified divisions. The staff of the computer centre also runs the Institute's video conferencing and multimedia facilities. The centre provides training to the staff according to their computational needs. Training programs and workshops are organized on a regular basis to promote use of Hindi language on computers.

Animal Facility

The animal facility of CSIR-IITR is located at the Gheru campus of the institute. Services of the facility are available to the institute and also to other Central/State Government establishments and private organizations. The services offered are broadly classified in the following categories:

- Professional veterinary services provided to all animal users as and when required during experimentation
- Supply of animals for different R&D projects and sponsored regulatory studies.
- Supply of surplus stock of animals to other institutions as per the guidelines framed by CPCSEA (Ministry of Environment and Forest, Animal Welfare Board), Government of India.
- Maintenance of breeding colony of different mice strains, viz., C57BL/6, BALB/c, swiss, SKH-1 and CD-1.
- Genotyping of Balb/c and SKH-1 mice through microsatellite markers.
- Supply of specific hairless mice-SKH-1 for their use in skin research.
- Hematology, biochemistry and histopathology services for all in-house R&D, regulatory toxicology, collaborative and sponsored projects.
- GLP and other toxicology/safety evaluation studies for oral-, dermal- and reproductive-toxicity etc.

New Facilities

Accelerated Solvent Extraction

Accelerated Solvent Extraction (ASE) is new advanced extraction technique for organic analytes in the solid samples, which works on elevated temperatures and pressures with liquid solvents. The technique is cost effective as the extraction of 1-30g sample takes less 15minutes, without any degradation of thermo labile compounds.

It is useful for solid environmental and biological samples of has many advantages over other conventional extraction techniques for organic molecule.

The advantages offered are:

- Rapid and efficient extractions
- Superior recovery with the higher throughput.
- Reduced solvent consumption
- Enhanced laboratory productivity

Accelerated solvent extraction facility at CSIR-IITR

सी एस आई आर
CSIR
आईआईटीआर
As
Cd
N
OH
Pb
Hg

AcSIR Ph. D. Programme at CSIR-IITR

Coordinator : Dr M. P. Singh (w.e.f. Sept 2020 onwards)
Dr N. Manickam (till Aug 30, 2000)
Co-coordinators : Dr S. Patnaik and Dr Smriti Priya
Assistant Manager: Mrs Swati Shrivastava

Under the aegis of the Academy of Scientific & Innovative Research (AcSIR), the Ph.D. programme at CSIR-Indian Institute of Toxicology Research (CSIR-IITR) is aimed to create highest quality researchers with multidisciplinary knowledge in the field of toxicology and associated areas of science and technology. AcSIR-Ph.D. programme in Biological Sciences and Chemical Sciences at CSIR-IITR provides state-of-the-art research facilities and a unique platform for research and innovation in toxicological sciences. The programme aims to strengthen the required skills and capabilities among research professionals under the mentorship of leaders in the field of toxicology. In addition to developing discipline-specific research skills, AcSIR-IITR PhD programme is structured to train and support the development of personal and professional competencies. This programme offers exciting opportunities to the candidates holding Master's degree with a valid fellowship (such as UGC/CSIR-NET/DBT/ ICMR/DST-INSPIRE or any other equivalent fellowship), having a keen aptitude and scientific inquisitiveness for pursuing advanced scientific research of global standards.

The AcSIR PhD programme in CSIR-IITR started in January 2011 and since then, 240 students have been enrolled. Total 79 students (68 in biological and 11 in chemical sciences) have completed PhD degree successfully. Every year, several hundreds of young enthusiastic candidates apply for few available seats and undergo rigorous screening and interview process. AcSIR-IITR Ph.D. students are expected to acquire a total of 20 credits (12 credits from the course work, 4 credits from project proposal and review article writing and the remaining 4 credits from CSIR-800 societal programme related project work) prior to submission of their thesis.

In the August 2019 and August 2020 session of AcSIR-IITR Ph.D. programme, the courses offered in biological & chemical sciences cover various facets of toxicology with the emphasis on both translational and fundamental research. Experienced faculty of CSIR-IITR teaches the courses with great enthusiasm every year. 62 scientists have been recognised as faculty of AcSIR-IITR till August 2020. In January/August 2020, 19 students were enrolled taking the total tally of 121 students enrolled in the AcSIR-IITR Ph. D. programme up to 2020. In year 2017, AcSIR had established a Memorandum of Understanding (MoU) with Royal Melbourne Institute of Technology (RMIT), Australia for a Joint badged Ph.D. program. CSIR-IITR is one of the active participants in this program and has also enrolled 02 more of its AcSIR students to work at RMIT, Australia. These students are the major work force of the institute carrying out research work in areas of national/international importance including the societal relevance.

During the last financial year, 18 students completed their course work while 11 others finished their comprehensive examinations as well. Further, 07 students submitted their thesis after acquiring the necessary 20 credits. Furthermore, 10 students successfully defended their theses in viva-voce examination and were awarded by provisional /final doctoral degrees. Several IITR graduates have successfully obtained reputed post-doctoral fellowships in US and European Universities, jobs in Government institutions and leading private companies.

In order to promote research in science and technology that has a bearing on social, economic, cultural and intellectual welfare of the people, AcSIR has mandated that the students aspiring to obtain a Ph.D. degree from the academy undertake a 6-8 weeks project concerned with societal/rural issues under the 'CSIR-800 societal programme'. Some of the targeted issues include deteriorating water quality (drinking water as well as groundwater), over-use of plastics, malnutrition, tobacco usage, groundwater contamination due to exposure to industrial waste (fertilizer industry and pharmaceutical industry), high pesticide usage, poor sanitation facilities, microbial contamination in the water of river Gomti (one of the tributaries of the river Ganges), food adulteration and improper maintenance of hygiene. Large number of village population have been educated for proper disposal of wastes and used chemical containers, preventing exposure to farm chemicals and general hygiene for better health care.

CSIR-Harnessing Appropriate Rural Interventions and Technologies (HARIT)

Our institute CSIR-Indian Institute of Toxicology Research, Lucknow ever since it was established constantly working for the rural upliftment through our scientific and technological achievements. During the period of report, AcSIR-IITR students through HARIT (formerly CSIR-800) programme worked for dissemination of knowledge in various regions of our Country. HARIT has been launched by CSIR with the aspiration of inclusive growth and improved quality of lives of 800 million fellow Indians through S&T interventions that are socially and economically relevant.

The ultimate aim of AcSIR is to create human resources who will promote research in science and technology having a bearing on socio-economic, cultural, intellectual and academic welfare of the people of our nation. Keeping this in view AcSIR has mandated that students aspiring to obtain a Ph.D. degree from AcSIR undertake a project concerned with societal/rural issues of the nation (4 credits) as a group activity (maximum: 5 students) with substantial contribution from each member of the group. The exclusive time period devoted to undertaking this project should be commensurate with 4 credits normalized with the number of students in the project team. The premise of this course is the aspiration of inclusive growth and improved quality of lives of the fellow underprivileged Indians through S&T interventions that are socially and economically relevant.

A total number of 08 students have undertaken the above programme in as many of villages covering the state 'Uttar Pradesh'. These students primarily focused on conducting awareness in the area of basic sanitation, protection from exposure to toxic chemicals, food safety and about the importance of water quality. Other major education imparted to these rural and semi-urban communities include awareness on use of plastic and their deleterious health effects. The education imparted also was about causes and prevention of diseases/disorder such as diabetes, diarrhoea and other water borne diseases. Realizing the facts that people are not well educated, students put effort to educate them using cartoons, pictures and illustrations. Overall these models of reaching rural / urban folk with our science and technology interactions in a "dual society" like India, the institute encouraged AcSIR students to reach maximum communities for awareness on health and environmental issues. Through these interactions, we have also understood the mission-oriented programme would be required to develop technologies to address the needs of the rural population.

Skill Development

Skill India
कौशल भारत-कुशल भारत

Skill development programmes at CSIR-IITR

Coordinator : Dr Devendra Parmar
Convener : Dr Ravi Ram Kristipati
Course Coordinators : Drs Adithya B. Pant, Nasreen G. Ansari, Alok K Pandey, Amit Kumar, B. Sreekanth, Parthasarathi Ramakrishnan, Er A. H. Khan

CSIR-IITR, a NABL (National Accreditation Board for testing and calibration Laboratory) accredited laboratory in the field of chemical and biological testing and has received GLP (Good Laboratory Practices) compliance for toxicity and mutagenicity studies has been in the forefront in imparting training and generating skilled manpower. Provisional of CSIR-IITR with two sectoral skill councils namely, Life Sciences Sector Skill Development Council (LSSSDC) and Agricultural Skill Council of India (ASCI), under National Skill Development Corporation (NSDC), reflect the commitment and alignment of the Institute to the Skill India mission of Government of India. As part of this Integrated skill development, CSIR-IITR has conducted multiple training programs in the areas of environmental health & Safety as well as and xenobiotic residue analyses.

Hands-on training program on "Fundamentals of Care, Management and Handling of Small Laboratory Animals used in Biomedical Research"

A five-day hands-on training program on "Fundamentals of Care, Management and Handling of Small Laboratory Animals used in Biomedical Research" was conducted at CSIR-Indian Institute of Toxicology Research from December 16-20, 2019 & January 20-24, 2020. This was the second in a series of workshops being organized by the institute for research scholars. The training program was conducted as per CPCSEA regulations and in accordance with CSIR-IITR's personnel training and qualification policy that mandates training for all animal users prior to first experimental use. The course primarily focused on the basics of laboratory animal husbandry, experimental procedures, and quality control measures. The participants gained an understanding of the fundamental requirements of laboratory animal care, management, and experimentation in a GLP compliant laboratory. The course also offered greater insight, competency, and responsibility towards the use of animals for research in new researchers. The exposure to GLP Principles will reiterate the importance of proper planning, controlled performance of techniques, faithful recording of all observations, appropriate monitoring of activities and complete archiving of all raw data obtained, so as to ensure global acceptance of the data generated from the experiments.

Hands-on training programme on "Fundamentals of care, management and handling of small laboratory animals used in biomedical research".

Participants and faculty at the training programme on "Fundamentals of care, management and handling of small laboratory animals used in biomedical research"

Workshop on Statistics and Software Applications for Air and Water Quality Assessment

A two days workshop on "Statistics and Software Applications for Air and Water Quality Assessment" during January 28-29, 2020 has been organized by CSIR-IITR, Lucknow. The focus of the workshop is to enhance the scientific knowledge and skills of students, engineers and scientists in the area of software & statistical applications for air and water quality data assessment. A total of 30 participants from various organisations across India are attending this workshop. The workshop instruction methods involve theoretical lectures, software and statistical tool demonstrations as well as hands-on-training to the participants.

Professor Alok Dhawan, Director, CSIR-IITR welcomed all the participants and speakers. Dr B. Sreekanth, Scientist, CSIR-IITR and convener of the workshop provided the overview of the course material to be covered in the workshop. The guest faculties include officials from Fluidyn Consultancy Pvt. Ltd., Bangalore, Airshed Planning Professionals, Kanpur (located at Incubation centre, IIT-Kanpur) and Datai2i Pvt. Ltd., Hyderabad who offered the practical demonstration and hands-on training with various software model applications and statistical techniques. Dispersion and receptor modelling techniques and database analysis tools have been demonstrated with case stay examples and practical orientation is done for participants in the workshop. Workshop brought together

Professor Alok Dhawan, Director, CSIR-IITR, addressing the participants

L-R Er. A.H. Khan, Dr D. Parmar, Professor Alok Dhawan, Dr B. Sreekanth and Dr Preeti Chaturvedi

various research scholars, scientists, industrialists, engineers, technology & service providers and officials from regulatory bodies. The programme is conducted under the umbrella of Department of Scientific and Industrial Research (DSIR) supported CSIR-IITR-Common Research and Technology Development Hub (CSIR-IITR-CRTDH). CSIR-IITR has established this "Environmental Monitoring Hub" with aim to undertake issues related to water monitoring, waste management, affluent treatment, air monitoring, etc. Further, CSIR-IITR-CRTDH will provide technological solutions to industries on pollution abatement as well as skill development in the area of environmental sustainability. CSIR-IITR is consistently working for monitoring, assessment and abatement of environmental problems such as air pollution, water pollution and soil pollution for more than 30 years.

Delegates and speakers at the Workshop

Skill Development Programme on Environment, Health and Safety Manager

CSIR-IITR along with National Skill Development Corporation (NSDC) and Life Sciences Sector Skill Development Council (LSSSDC), Government of India, under the CSIR-Integrated Skill initiative has organized the skill development programme "Environment, Health and Safety Manager (LFS/Q0214) " from 3rd to 25th February, 2020. During these three weeks, twelve graduate and post-graduates in science have been trained in the areas of environmental health and safety related legislations, work area air quality & industrial hygiene, environmental management in industry, environmental monitoring and waste management, applied ergonomics, occupational health, hazard management and industrial safety. Skilling in the areas of environment, industrial hygiene and occupational health components was imparted by the CSIR-IITR scientists having more than 25 years of experience. Candidates were also given demonstrations involving personal protective equipments used for the safety by the personnel (external faculty) working in Industrial setup. Assessment of the trainees was done

Professor Alok Dhawan, Director, CSIR-IITR, addressing the participants

Dr S. C. Barman, Chief Scientist, delivering a lecture in the skill development programme

independently by assessors from LSSSDC through online test and practical examination as well as viva-voce on 25th February, 2020. Eleven participants have qualified the test and a certificate from Government of India, Ministry of Skill Development & Entrepreneurship for "Environment, Health and Safety Manager – Life Sciences (QP No. - LFS/Q0214) conforming to National Skill Qualifications Framework Level-7' was issued to them.

Participants at the skill development program undergoing third party evaluation

NSDC approved training program on "Soil & Water Testing Lab Assistant"

A training program on "Soil & Water Testing Lab Assistant (AGR/Q8102)" was conducted at CSIR-Indian Institute of Toxicology Research from 31st December 2019 to 21st January 2020. This program is approved by Agriculture Skill Council of India (ASCI) under the National Skill Development Corporation (NSDC). This training is being conducted as part of the CSIR-Integrated Skill Initiative. 24 women participants from Isabella Thoburn College, Lucknow (the first and oldest women College in South Asia) are being trained. Dr Vinita Singh Prakash, Principal, IT College was the Guest of Honour. The course covered six modules on sanitation and safety guidelines, preparation of soil and water samples for analysis in the lab, calibration of equipments, preparation of solutions, soil and water health

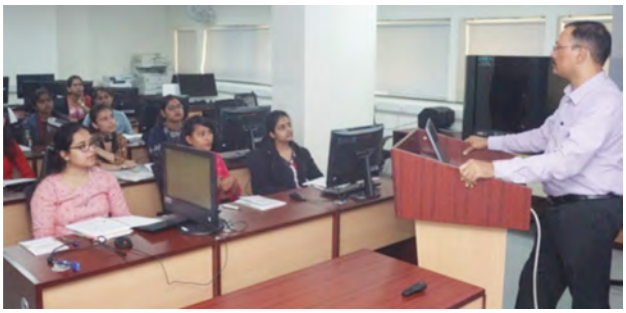
Professor Alok Dhawan addressing the training programme on "soil and water testing lab assistant (AGR/Q8102)"

card along with soft skills, computer literacy and financial literacy in 200hours as per National Skill Qualification Framework (NSQF) and National Occupational Standards (NOS). The emphasis has been laid on the hands-on training to the participants.

Participants and faculty at the training programme on soil and water testing

One day workshop on skill development in Genetic Toxicology

CSIR-IITR organized a One day Workshop on Skill Development in Genetic Toxicology on March 03, 2020. The objective of the workshop was to provide hands-on experience on some of the most relevant assays for the safety or toxicity evaluation of toxicant using state of art techniques in genetic toxicology to the participants from different institutes to learn the techniques. Twenty seven participants from various academic institutions have participated in the workshop. A "Protocol Manual" incorporating several valuable laboratory protocols such as the Comet, Ames, micronucleus and chromosomal aberration assays was published and distributed among the participants. The workshop began with the introduction by Dr Ravi Ram Kristipati, convener, skill development at CSIR-IITR. In the pre-noon session presentations, were given by workshop coordinators, Dr Alok K Pandey and Dr Amit Kumar, on basic principles of genetox and regulatory requirements, Chromosomal aberrations, Micronucleus assay, Comet assay and Ames test. In the post- noon sessions, participants had hands on demonstrations of these assays in the laboratory. The workshop concluded with the Valedictory function wherein certificates were distributed to the participants. Dr Alok Kumar Pandey and Dr Ravi Ram Kristipati took feedback and thanked the Associate faculties and participants for their effort and for their cooperation and support to make the workshop a success.



One day workshop on skill development in genetic toxicology organised by CSIR-IITR. Participants and faculty interacting during different sessions.

Workshop on Flow Cytometry

CSIR-Indian Institute of Toxicology Research organized a 3 day workshop on Flow Cytometry. Experts from Industry and Academia acted as faculties for the course and hands-on training module. The session began on 16th December with opening remarks by Dr Amit Kumar, coordinator of the workshop followed by the introduction of the participants and trainers. Participants from different institutes of Lucknow such as King George's Medical University (KGMU/KGMC), SGPGIMS Lucknow, Bba University Lucknow, and CSIR-IITR along with its sister laboratories CSIR-CDRI and CSIR-NBRI took part in the workshop. The first session was related to basics of the flow cytometry and its applications followed by demonstrations of the instruments available at the host institute. Both hardware and software demonstrations and capabilities of the instruments were discussed in detail. The faculties of CSIR-

Interaction during the workshop

IITR with experts from the industry helped the participants prepare samples from various biological materials such as plant, mouse, and mammalian cells for hands-on training demonstration. There were four sets of experiments done including DNA ploidy in plant cells, exosome analysis, multi-colour immunophenotyping, and T-cell identification in mouse splenocytes. The participants performed multi-colour stainings and performed sample analysis in the supervision of experts. The quality control methods were also demonstrated for ensuring data reproducibility. The participants had the opportunity to perform the hands-on their own, the data analysis and arrive at scientific conclusions. The final experimental session included exposure to FACS based cell-sorting technology and performed the cell-sorting assay in the supervision of Mr Puneet Khare and Dr Amit Kumar. The last session of the workshop included hi-parameter multi colour data analysis: possibilities and challenges followed by a demonstration on Basic concept of unsupervised Flow Cytometry and data analysis by Dr Pradeep Kumar Rai from BD (Becton, Dickinson and Company). The workshop concluded with the address of Alok Dhawan. He encouraged both the faculties and participants to raise the bar further and include advanced approaches in the domain incoming workshops and in an individual's research.

Participants and faculty at the 3 day workshop on flow cytometry

Add-on Course in Analytical Toxicology

The New Education Policy–2020 lays emphasis on strengthening the link between research and teaching at the undergraduate level. It is believed that this approach towards skill-based learning will help individuals identify skill sets much earlier, thereby fostering a strong culture for innovation and empowering students to be future-ready. Echoing the same, CSIR–Indian Institute of Toxicology Research (CSIR-IITR) jointly with Hindu College, University of Delhi, offered Add-on Course on Analytical Toxicology under the umbrella of CSIR Integrated Skill Development Initiative. The course was inaugurated by Dr Shekhar C. Mande, Director General, Council of Scientific and Industrial Research (#CSIR) and Secretary, Department of Scientific and Industrial Research, Government of India. During inauguration, Dr Mande emphasized the role of CSIR in fostering a technology, research, and innovation-driven ecosystem in academic institutions of the country. Professor Alok Dhawan, Director, CSIR–IITR shared the salient features of this field and its scope for various avenues in the real world. He highlighted that Toxicology has always been a translational science that defines the domains of safety. Dr Anju Srivastava, Principal, Hindu College, Delhi, reiterated that the college has always striven for providing learning experience beyond the curriculum and this is another such

attempt in that direction. Also present on the occasion were Shri Sant Sanganeria ji and Ms. Bhuwana from Ultra International Limited. The inaugural event also included an interactive question and Answer Session involving the students, DG-CSIR and Director, CSIR-IITR. Earlier, Dr D. Parmar, Chief Scientist, CSIR-IITR introduced the students genesis, curriculum and aim of the online analytical toxicology program. During the course, 52 participants from different colleges of Delhi have been virtually trained various high-end analytical equipments (including GC-MS, LC-MS, HPLC and UHPLC) and techniques. Dr Nasreen G. Ansari, Senior Scientist, CSIR-IITR and Dr. Reena Jain, Vice Principal, Hindu College, Delhi were the course coordinators. All the students successfully completed the course on August 17, 2020 and e-certificates have been distributed to the students.

Professor Alok Dhawan, Director, CSIR-IITR along with Dr Shekhar C Mande, Director General, CSIR and Secretary, Department of Scientific and Industrial Research, Government of India, inaugurating the programme

Summer Research Training Programme (SRTP-2020)

Amid COVID-19 pandemic, when the whole world was presented with the surmounting challenges of survival, CSIR continued its effort to present cutting edge scientific research. A group initiative has been taken by the CSIR, India together with Director General-CSIR, Dr Shekhar C. Mande, Dr G. Narahari Sastry, Director, North East Institute of Science and Technology, Jorhat, Professor Alok Dhawan Director, CSIR-Indian Institute of Toxicology Research, Lucknow and others CSIR laboratories to set off an online Summer Research training Programme (SRTP-2020). The motto of this training programme is to provide a scientifically stimulating platform to the students and teachers and expose them to scientific research and create opportunities to engage and connect students to bring forth innovativeness and creativity to combat COVID-19 pandemic, through science and technology research projects.

CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow started CSIR-Summer Research Training Programme-2020 on 1st July 2020 with more than 150 students. Professor Alok Dhawan, Director, CSIR-IITR, chaired the introductory session and addressed all the participating candidates of SRTP-2020 programme. He highlighted the achievements of CSIR in the country and covered cutting edge research of CSIR-IITR in the areas of Nanomaterial Toxicology, Environmental Toxicology, Food, Drug & Chemical Toxicology, Computational Toxicology, Systems Toxicology & Health Risk Assessment and Regulatory Toxicology. Dr R Parthasarathi Ramakrishnan (Coordinator, CSIR-IITR SRTP-2020) briefed the overall structure of the programme and shared the details & schedules of technical demonstration, scientific session, and mentoring activities. The programme was divided into two project types– group project and individual project according to the interest shown by the students. The group project had more than 100 students while individual projects were carried out by 26 students. The mentors were allotted according to their interest area. The online lecture series and interactive session from eminent scientists of our institute were conducted. Several

Professor Alok Dhawan, Director, CSIR-IITR, addressing the introductory session

emerging topics such as "Nanotechnology & Nanotoxicology" by Dr Alok Pandey (Principal Scientist, CSIR-IITR), "Environmental Toxicology" by Dr N Manickam (Chief Scientist, CSIR-IITR), "Food Toxicology by Dr Kausar Mahmood Ansari (Principal Scientist, CSIR-IITR), " Computational Toxicology " by Dr R. Parthasarathi (Principal Scientist, CSIR-IITR), "Introduction to Regulatory Toxicology" by Dr AB Pant (Senior Principal Scientist), "Alternate to Animal Models" by Dr Ravi Ram (Principal Scientist, CSIR-IITR) were covered. An effective Technical demonstration session on Microbial biotechnology for pollution abatement by Dr N Manickam and his team was conducted.

Students also shown great enthusiasm in the programme and also asked many interesting questions related to the various scientific fields like Translational Research, biological toxins, in silico prediction and modeling, genetically modified food products, immunology, drug development, and toxicology. The students have submitted the assignment for the completion of the programme. The e-certificates were distributed to the participants on the CSIR-Foundation Day, September 26, 2020. They expressed their gratitude to the SRTP-2020 team of CSIR-IITR for the organizing such an invoking training programme.

Jigyasa programme: Enriching Scientific Temperament among the school children

CSIR-IITR has been conducting Jigyasa programme regularly to inculcate scientific spirit among the school children. CSIR-IITR organized a series of events for school students' visit to the campus where they are encouraged to take up hands-on experiments and interact with skilled and experienced scientists/ research scholars. A total of 110 Students of Seth Vishambhar Nath Institute of Pharmaceutical Sciences, Barabanki along with five faculty members visited CSIR-Indian Institute of Toxicology Research on November 22, 2019, Gheru Campus and interact with the scientists. Students and the faculty members visited Animal Facility, Ecotoxicology & Inhalation Toxicology, Environmental Monitoring, Microbiology and Water Analysis laboratories.

A one day visit for school students of Kendriya Vidyalaya Sangathan, Fatehgarh 11th standard on December 10, 2019 was organized. 75 students and 4 teachers from to Kendriya Vidyalaya Sangathan, Fatehgarh attended the event. Dr R. Parthasarathi, Principal Scientist & Nodal for CSIR-Jigyasa Programme of CSIR-IITR welcomed the students & teachers and gave a brief overview of the student's activities and the inception of Jigyasa-Scientist-student connect programme such as Be-A-Scientist and Empowering Pupil Innovation & Creativity (EPIC) of the institute. Students and teachers visited Advanced Imaging Facility, Computational Toxicology Facility, Food Toxicology, Cell & Molecular Biology Facility, and Translational Laboratory. Research scholars of CSIR-IITR demonstrated hands-on training to the students on DNA isolation, building and visualizing molecules and chemicals, detecting adulteration/contamination in oil and electron microscopy. The students showed enormous inquisitiveness regarding various aspects of research activities of the institute particularly on environmental issues and their remediation's. The zeal was high among the students and they showed a lot of interest in pursuing career in the research field. After the lab visits, students were engaged in an interactive session with Professor Alok Dhawan, Director, CSIR-IITR where he shared inspirational thoughts and motivated students on how to handle challenges in front of them and developing an orientation to pursue science as well as a successful career. Students and teachers also shared their experiences and feedback. They highly appreciated the CSIR-IITR team efforts for the event. Professor Alok Dhawan, Director, CSIR-IITR presented the memento to all the visiting teachers of Kendriya Vidyalaya as a token of appreciation & making this event successful.

One day visit to the campus for undergraduate and postgraduate students

CSIR-IITR organized a one day visit for 48 undergraduate and postgraduate Biotechnology students along with three teachers from C. K. Thakur College, Navi Mumbai on February 3, 2020. Professor Alok Dhawan, Director, CSIR-IITR addressed the participants and shared inspirational thoughts and motivated students to follow a career in science and to unravel the decisive problems of the society that will be beneficial to the social order. After, the interactive session students and teachers visited Advanced Imaging Facility, Computational Toxicology Facility, Food Toxicology, Genome and Cell Integrity Laboratory, Molecular Biology Facility, and Translational Laboratory. Scientists and Research scholars of the institute demonstrated DNA isolation, building and visualizing molecules and chemicals, detecting adulteration/ contamination in oil and electron microscopy.

Students participating in the programme

XLIV Annual Conference of Environmental Mutagen Society of India & International symposium on present and future challenges of xenobiotic mediated mutagenesis: Impact on human health & environmental safety (EMSI-2020)

The 44th Annual Conference of Environmental Mutagen Society of India (EMSI) and International Symposium on Present and Future Challenges of Xenobiotic Mediated Mutagenesis: Impact on Human Health & Environmental Safety (EMSI-2020) was inaugurated on 18th February 2020 with a keynote address by Professor K. Muniyappa, IISc, Bengaluru. The scientific themes of the symposium included Genetic toxicology and nano-genotoxicity, DNA Damage and Repair, Environmental mutagens and health risk, Food borne mutagens & Food safety, Bioremediation of environmental chemicals, Alternatives to the use of animal models for mutagenesis studies, molecular mechanisms of mutagenesis and carcinogenesis apart from a panel discussion on the path forward in the area of genetic toxicology.

Professor P. K. Seth along with Professor Alok Dhawan, Director, CSIR-IITR, inaugurating the conference by lighting the lamp

Several researchers from India and other countries including UK, USA and Iran delivered the lectures and actively participated in the scientific deliberations.

During this three day symposium, there were three key note lectures, 6 plenary talks, 27 invited lectures, six platform presentations apart from the young investigator competition where 9 young researchers presented their doctoral work. Also, there were 28 posters presented by young researchers during this symposium. Presentations made by the young investigators were judged by 3 neutral experts.

The scientific sessions on day 1 witnessed presentations on Genetic toxicology and nano-genotoxicity in the fore noon session and a session on DNA Damage and Repair in the post lunch session. During Poster Presentation Session, 28 students presented their work and were benefitted with the suggestions from the delegates or peers in their domain of work.

Day 2 (19th February, 2020) started with the key note address by Professor. Gareth J Jenkins, Swansea University, UK. Detection of mutations, health impacts of environmental mutagens, Food borne mutagens & Food safety, and Bioremediation of environmental chemicals were the key topics of deliberations on the second day. Several Young research scholars also presented their data in the "Young investigator award session". They received constructive suggestions to enhance their research work from the session chairpersons and other dignitaries.

L-R: Dr Alok K Pandey, Dr Birajlaxmi Das, Professor Alok Dhawan, Professor K. Muniyappa, Dr K. B. Sainis, Dr D. Parmar and Dr Ravi Ram Krishtipati

Professor K. Muniyappa from IISc, Bengaluru delivering the keynote lecture

Professor Alok Dhawan, Director, CSIR-IITR felicitating Dr K B Sainis

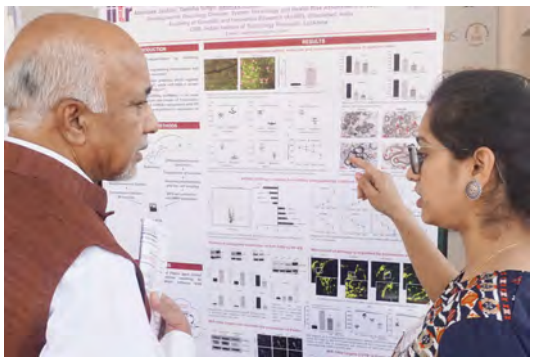
Day 3 (20th February, 2020) started with the key note address by Professor. Dianan Anderson, Bradford University, UK. This was followed by a session on Alternatives to the use of animal models for mutagenesis studies which highlighted the need, utility as well as advantage of alternate animal models including Drosophila, C. elegans and cell lines. During this session, as a mark of respect for the tremendous contributions to this field, Dr. D. Kar Chowdhuri, Chief Scientist of CSIR-IITR was felicitated.

Professor Alok Dhawan, Director, CSIR-IITR along with other dignitaries felicitating Dr D. Kar Chowdhuri

Professor Alok Dhawan, Director, CSIR-IITR presenting memento to Professor K. Muniyappa

The penultimate session of the conference focused on molecular mechanisms of mutagenesis and carcinogenesis. Eminent Scientists from India and abroad in the area of environmental mutagenesis discussed at length the way forward and suggested the following:

1. Early predictions of disease and to develop cost effective kit should be the top priority of the Scientists and Fellows.
2. Very low level of Environmental pollutants is harmful to human health and thus, basic as well as transnational research should be accelerated.
3. New Approach should be incorporated in the Environmental Mutagen Society i.e. Muat-Genomics.
4. Basic Course of Toxicology should be started at Undergraduate level and further, advanced courses at Post-Graduation level in the University.
5. Skill Development Programs in various aspects of environmental mutagenesis including geno-toxicology should be more frequent.



Poster presentation by students at EMSI-2020

Panel discussion at the 44th annual conference of Environmental Mutagen Society of India (EMSI-2020)

Valedictory function of the EMSI-2020. L-R: Dr Ravi Ram Krishtipati, Dr D. Parmar, Professor Alok Dhawan, Professor Gareth J. Jenkins, Professor P. K. Seth, Dr Birajlaxmi Das, Dr Alok K. Pandey.

Professor Gareth J. Jenkins distributing the prize for best poster presentation along with Professor Alok Dhawan and Professor P. K. Seth.

Professor Alok Dhawan felicitating Professor Gareth J. Jenkins

Group photograph of delegates and organizers at the 44th annual conference of Environmental Mutagen Society of India (EMSI-2020)

One day webinar on "Alternatives to animal models in biological research"

Whether the requirement is to mimic human disease conditions or to predict the response of the human body to candidate drugs, numerous animal models have been the main stay of research. However, in recent times there has been an increasing thrust towards developing alternatives to animal models. These alternatives are widely employed in conducting research for the ultimate benefit of human health and environmental safety. Over the last three and a half decades, CSIR-Indian Institute of Toxicology Research has been at the forefront of developing such alternatives to animal models and spearheading this effort. To further expand the scope of this key area in biological research by triggering a dialogue between different stakeholders and to celebrate his yeomen contribution in the area, a one-day Webinar on "Alternatives to Animal Models in Biological Research (AAMBR 2020)" was organized at the institute on Wednesday, May 27, 2020. Eminent speakers at the webinar included Dr C.M. Gupta and Dr V.P. Kamboj, both former Directors, Csir Cdri; Prahlad Seth former Director, CSIR-IITR; Dr Tapas Kundu, Director CSIR-CDRI and Alok Dhawan Director, CSIR-IITR. Yogendra Kumar Gupta, Chairman Research Council, CSIR-IITR delivered the Keynote address. Professor S C Lakhotia, INSA Senior Scientist, Banaras Hindu University, in his address, reiterated that as in cell culture studies both induction and the innate potential of the cell are key driving factors for proliferation, so also in a researcher's career, the initial thrust and his/her competence are key to a successful research career.

Scientific deliberations during the webinar touched upon varied topics like 3D cultures and modeling, the role of epigenetics in neurological diseases, use of Drosophila as a model to study tumour surveillance, to name a few. Following the scientific sessions, the webinar concluded with the felicitation of Dr D Kar Chowdhuri, Chief Scientist, CSIR-IITR, for his contributions in the area of alternatives to animal models.

Professor Alok Dhawan, Director, CSIR-IITR, felicitating Dr D. Kar Chowdhuri

Participants at the one day webinar on "Alternatives to animal models in biological research"

Webinar on "Environmental Management: Challenges and Road Ahead: EMCR-2020"

CSIR-Indian Institute of Toxicology Research organized a half day Webinar on "Environmental Management: Challenges and Road Ahead" on June 29, 2020. The purpose of the webinar is to expand the scope of Environmental Research at the Institute and to initiate a dialogue in this important area during the current COVID-19 pandemic. This will also create awareness towards environmental quality in the citizenry at large.

Environment management solutions require a perfect blend of what is technologically practical and ecologically essential. New initiatives need to complement traditional regulatory processes. Existing regulations, such as Environmental Protection Act, Air Act and Water Act are important safety nets in India for protecting human health and the environment. However, emerging challenges such as urban sprawls, climate change and resource depletion require renewed approaches towards integrated problem-solving. Discussions are also required to understand the implications on environmental, social and economic sustainability. EMCR-2020 addressed the drivers for change, the implications of inaction, and key factors to achieve industrial development coupled with environmental and social sustainability. The first lecture of the webinar by Professor Virendra Sethi, IIT Bombay, Mumbai addressed region specific emission factors of coal based cook stoves. This was followed by a talk on industrial business and biodiversity by Mr Peter Dsouza, DGM Environment, TATA Motors, Lucknow. Lectures were also delivered on the environmental status and air quality of Lucknow city during the lockdown periods since March 25, 2020.

This webinar was concluded with the superannuation felicitation of Dr S. C. Barman, Chief Scientist, CSIR-IITR, who has spent almost three decades in pursuing research and service sector on environmental monitoring. Dr Barman shared his research experiences while participating in the environmental assessment activities as well as the environmental status report on Air Quality of Lucknow city.

Participants at the webinar

Dr S. C. Barman addressing the webinar along with Professor Alok Dhawan

Professor Alok Dhawan felicitating Dr S. C. Barman on the occasion

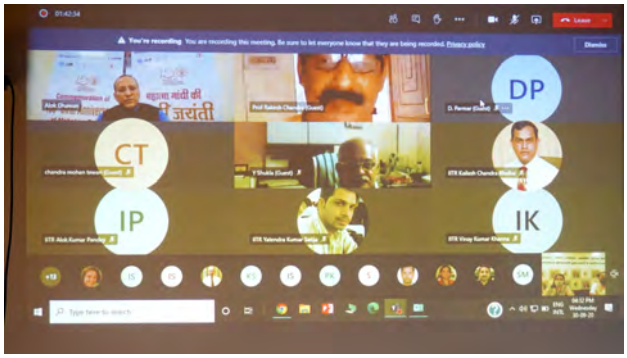
Commemoration of 150th Birth Anniversary of Mahatma Gandhi Ji

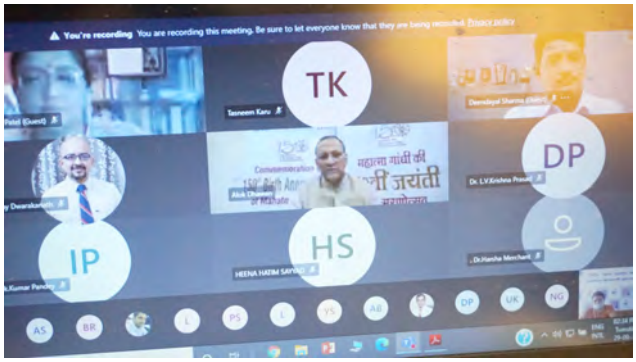
At CSIR-IITR in Commemoration of 150th Birth Anniversary of Mahatma Gandhi following activities were conducted during 28th September to 2nd October, 2020 at CSIR-IITR, Lucknow.

- Talks by eminent personality
- Essay writing competition- Students and faculty
- Quiz competition- Students and faculty
- Plantation of tree saplings in Gheru campus of CSIR-IITR
- Cleanliness drive in both the campuses
- Quotes/ stickers displayed in offices/ corridors
- Movie clips/ quotes of Mahatma Gandhi displayed on video wall
- Books on Mahatma Gandhi displayed in the library

To commemorate the 150th Birth Anniversary of the Father of Our Nation, Mahatma Gandhi, CSIR-Indian Institute of Toxicology Research (CSIR-IITR) organized several activities during the concluding week of the celebrations i.e. September 28 - October 02, 2020. Various activities include invited lectures, essay competitions, quiz competitions etc.

Among the invited lectures planned, Professor Vibhuti Patel, Former Professor, The Advanced Centre for Women's Studies, Tata Institute of Social Sciences (TISS), Mumbai delivered a talk entitled "Mahatma Gandhi and Empowerment of Women" on September 29, 2020. In the present scenario of the Covid-19 Global pandemic, the talk was arranged in the virtual mode. Mahatma Gandhi strongly believed that there is no occasion for women to consider themselves subordinate to men. In fact, if strength means moral power, then woman is immeasurably man's superior, he said. He always saw women as equal partners in the freedom struggle. Professor Vibhuti Patel reiterated Gandhi Ji's profound belief that a woman is an embodiment of sacrifice and Ahimsa. In her talk, she highlighted the role of women in social reforms such as anti-liquour movement





Virtual commemoration of 150th birth anniversary of Mahatma Gandhi

Professor Alok Dhawan emphasizing on the Gandhian thoughts and philosophy towards self sustainability

and Green belt movement. Professor Alok Dhawan, Director, CSIR - IITR opined that the onus to ensure gender equality is as much an individual responsibility as much as the government has a role in it. He also re-emphasized the role of women in the freedom struggle and the impact they had on evolution of Gandhian thought and philosophy.

In continuation of the on line lecture series, Professor Rakesh Chandra, Department of Philosophy, University of Lucknow, Lucknow, delivered a talk entitled "Gandhi's Eutopia and Some Reflections" on September 30, 2020. Professor Chandra enlightened the audiences with Mahatma Gandhi's life style, his works towards non-violence, Gram Swarajya, feminism etc. and also asked to look ourselves inside that whether we have been succeeded in implying the ideology of Mahatma Gandhi. In his address, Professor Alok Dhawan, Director, CSIR - IITR emphasized Gandhian thought and philosophy towards sustainability. On October 01, 2020 first lecture was delivered by Ms Mirai Chatterjee, Director of the Social Security Team at Self-Employed Women's Association (SEWA), Ahmedabad. In her talk on "Remembering Gandhiji Today", she spoke at length about Gandhiji's practice of simple living. Gandhiji was deeply convinced with the idea of "Anuband" and Ms Chatterjee opined that the current Covid-19 pandemic once again reminds us about the importance of maintaining an inter-connect with nature. She reiterated the importance of ensuring a congruence between ones thoughts and actions to ensure global self sufficiency. In his address, Professor Alok Dhawan, Director, CSIR - IITR opined that learning is a lifelong process the impetus is on all of us as citizens of this country to try and inculcate Gandhiji's ideals in our daily lives.

October 01, 2020 second lecture was delivered by Professor Anil K Gupta, Visiting Faculty, Indian Institute of Management, Ahmadabad and Founder, Honey Bee Network, SRISTI, GIAN and National Innovation Foundation. His lecture introduced the concept of "Gandhian Legacy of Inclusive Innovations and Social Development". He said that Gandhiji's famous talisman of thinking about the most marginalized person in society when faced with a decision making situation is as relevant today as it was a century ago. Professor Gupta said that the opportunity to learn is abundantly present all around us and we can all learn from every person we meet in the laboratory of life. He also exhorted research scholars to search for, spread and celebrate innovations while also striving to sense unmet needs of the society at large. Elucidating his thoughts, Professor Alok Dhawan, Director, CSIR - IITR thanked Professor Gupta for his mesmerizing lecture and said that experiential learning and practicing what one preaches, the key learning from Gandhian philosophy are key to ensuring the principle of Antyodaya. Inclusivity and sustainability should form the bedrock of scientific pursuits, he said.

Plantation of sapling by Professor Alok Dhawan in the memory of Mahatma Gandhi

Music is an extremely powerful tool of communication and it does so in a very simple and lucid manner and effective communication is key to ensuring peoples participation in combating the global challenge of climate change and environmental degradation. Mahatma Gandhi believed that every individual is empowered to make a change and it is up to us to believe in ourselves and make whatever possible small change towards meeting the sustainable development goals. Sharing these thoughts, Professor Ricky Kej, National Institute of Advanced Studies, Bangalore and Grammy Award Winner, delivered his lecture on "Gandhian Way of Self-sustainable Living" as a part of the celebrations to commemorate the 150th Birth Anniversary of Mahatma Gandhi, at CSIR-Indian Institute of Toxicology Research (CSIR-IITR). Grammy® Award Winner & US Billboard #1 artist, Ricky Kej is an internationally renowned Indian Music Composer and Environmentalist, having performed at prestigious venues in over 30 countries. He is the UNESCO "Global Ambassador for Kindness", UNCCD "Land Ambassador", UNICEF "Celebrity Supporter" & Ambassador for "Earth Day Network" The lecture was arranged in the online format given the current pandemic situation. Sharing his thoughts, Professor Alok Dhawan, Director, CSIR - IITR opined that Professor Ricky Kej, through his music enriched lecture, created a portrait of the Mahatma which is very relevant in these current times of excessive global consumption. It was indeed a befitting culmination of the week long celebrations at CSIR-IITR to listen to Ricky Kej on Gandhi Jayanti, deliver a lecture on Gandhiji and sustainable living.

Gandhiji was way ahead of his time when he made a clarion call to his countrymen to suggest methods to improve the Charkha, which was most dear to him. This is surely among the first instances of "crowd sourcing" to drive "innovation", both of which are buzzwords today. This was the thought echoed by Mr Ravi Pandit, Chairman and Co-founder, KPIT Technologies Ltd., Pune in his talk titled "Gandhian Innovation and its Relevance in Today's World". On October 2, 2020, Mr Pandit said that, though Gandhiji looked towards scientific methods to tackle situations, he insisted that Science should always go in hand with Humanity. Science should not denigrate humans and should always be used for the benefit of the multitudes. Mr Pandit was delivering a lecture as a part of the concluding week celebrations to commemorate the 150th Birth Anniversary of the Father of Our Nation, Mahatma Gandhi, at CSIR-Indian Institute of Toxicology Research (CSIR-IITR) In his opening remarks, Professor Alok Dhawan, Director, CSIR - IITR reminisced about his childhood experiences with the Gandhian way of life. He also thanked Mr Pandit for taking time out and addressing the CSIR-IITR family on the occasion of Gandhi Jayanti.

Dr Alok Pandey, Principal Scientist, CSIR-IITR welcomed all the participants to the online lecture and introduced the speakers. All the lectures were followed by an interactive discussion moderated by Dr Preeti Chaturvedi, Senior Scientist, CSIR-IITR. Concluding the programme, Dr Yetendra Satija, Scientist and Dr Aruna Satish Senior Scientist, CSIR-IITR delivered the Vote of Thanks.

Professor Alok Dhawan, Director CSIR-IITR, presenting the book on Quotes of Mahatma Gandhi to Shri Yogi Aditya Nath, Hon'ble Chief Minister, Uttar Pradesh

23rd Professor Sibte Hasan Zaidi Oration

The 23rd Professor Sibte Hasan Zaidi Oration was organized at the premier toxicology institute of the country, CSIR – Indian Institute of Toxicology Research. The lecture is organized every year to honour the founding Director of the institute, Professor Sibte Hasan Zaidi. As a part of the 54th Annual Day Celebrations this year, the lecture was delivered by Dr Rakesh K. Mishra, Director, CSIR – Centre for Cellular and Molecular Biology, Hyderabad.

Dr Rakesh K. Mishra, Director CSIR- Centre for Cellular and Molecular Biology, Hyderabad delivering the 23rd professor Sibte Hasan Zaidi oration on "The Rise of Genomics: Opportunities and Challenges"

Welcoming the gathering, Professor Alok Dhawan, Director, CSIR-IITR said that the visionary Professor Zaidi created this institute more than 50 years ago focusing on translational research to ensure environment safety and service to industry, which are relevant to this day. It was indeed a special occasion for the institute and its staff with the presence of several luminaries in the field of toxicology among the audience, he said.

Dr Devendra Parmar, Chief Scientist, introduced the guests, Dr Rakesh K. Mishra and Dr V. P. Kamboj, Chairman, Board of Directors, Biotech Consortium of India Limited, Former Director, CSIR – Central Drug Research Institute and President of the function. This was followed by the Oration on "The Rise of Genomics: Opportunities and Challenges". One of the most amazing advances in life sciences has been the ease and affordability of genome information. This information provides an extremely comprehensive insight into life processes, he said. He opined that these unprecedented opportunities are likely to be game changers in the manner healthcare challenges will be approached henceforth.

Dr V. P. Kamboj delivering the presidential address at the oration

Delivering the presidential address, Dr V. P. Kamboj, congratulated Dr Rakesh K. Mishra for his lucid presentation and added that theories on the origin of life reiterate the fact that almost all life forms have a commonality of origin from five basic elements. Using advancement in genomic research to create affordable personalized therapeutic regimens is the need of the day, he said. He also opined that the ever growing concern of air and water pollution needs a more concerted effort from all the stake holders to ensure a cleaner and greener environment for the generations to come. Dr Vinay K. Khanna, Senior Principal Scientist, CSIR – IITR, proposed the vote of thanks.

Professor Alok Dhawan, Director, CSIR-IIITR, presenting the memento to Dr V.P. Kamboj

Professor Alok Dhawan, Director, CSIR-IITR presenting the memento to Dr Rakesh K. Mishra

54th Annual Day Celebrations at CSIR-IITR

CSIR – Indian Institute of Toxicology Research, the premier toxicology institute in the country, celebrated its 54th Annual Day on November 14, 2019 at its Mahatma Gandhi Marg, Lucknow campus.

Padma Bhushan, Professor P. Balaram, Director General, Indian Council of Medical Research (ICMR), New Delhi and Former Director, Indian Institute of Science, Bengaluru was the chief guest of the function and delivered the Annual Day Address. Dr Rakesh K. Mishra, Director, CSIR – Centre for Cellular and Molecular Biology, Hyderabad was the Guest of Honour for the event.

Professor Alok Dhawan, Director of the institute welcomed the gathering and presented the annual report of the institute for the year 2018-2019. He apprised the gathering about several success stories of the institute in the year gone by and said that the Foundation Day was an appropriate occasion to cherish the successes of the past and set goals for the future. He reiterated the institute's commitment to the National Mission Programmes like Swachh Bharat, Swasth Bharat, Skill India, Namami Gange etc and informed the gathering that, in synchronization with the Digital India Programme, the institute has been releasing its Annual Report in the digital format since 2015.

Chief guest of the function, Padma Bhushan, Professor P. Balaram, inaugurating the 54th Annual Day celebrations by lighting the lamp

Professor Alok Dhawan, Director, CSIR- IIITR presenting the annual report of the institute of the year 2018-19

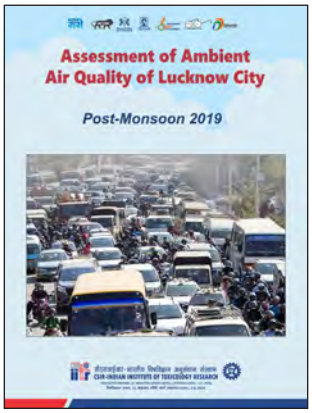
On the occasion, CSIR-IITR Annual Report, compilation of CSIR-IITR news articles and the institute's calendar for the year 2020 was released. Several staff members of CSIR-IITR were recognized for their distinguished service to the institute and honoured by the chief guest. Following release of the publications, Dr D. Kar Chowdhuri, Chief Scientist, CSIR – IITR, introduced the guests.

While delivering the Annual Day address, Professor Balaram, a doyen in the area of molecular biophysics said that, nowadays most disciplines border on science and engineering. He opined that in this day and age of interdisciplinary approaches, basic science research is the

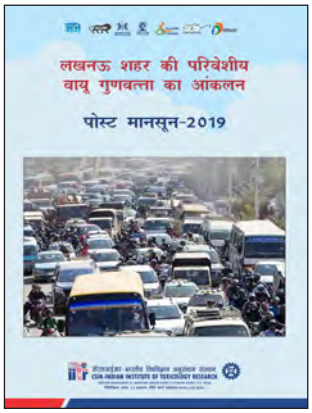
Dignitaries releasing the annual report of CSIR-IITR

Following documents published by the Institute were also released on the occasion :

Hindi version of
Annual Report 2018-19



Report on Post Monsoon Air Pollution
in Lucknow City



Hindi version of Report on Post Monsoon
Air Pollution in Lucknow

CSIR-IITR Calendar - 2020

Compilation of News of CSIR-IITR

foundation that is essential to ensure the success of any translational outcomes. Any Institute's annual day, while being a time for celebration is also the right time to reflect on the purpose of its creation and whether the outcomes envisaged have been achieved. He further encouraged the scientific gathering to keep up their zeal and enthusiasm in meeting scientific challenges that they are faced with.

In his presidential address, Dr Rakesh K. Mishra congratulated the CSIR–IITR family on the important milestone reached and urged the scientists to rededicate themselves to fulfilling the motto of the institute i.e. Safety to Environment and Health and Service to Industry.

Dr K. C. Khulbe, Senior Principal Scientist proposed the vote of thanks. The celebrations concluded with a cultural extravaganza by the research scholars, staff and their families of the institute who showcased their creative and innovative capabilities in addition to their scientific achievements.

Dr. Rakesh K. Mishra, Director, CSIR-Centre for Cellular and Molecular Biology, Hyderabad delivering the presidential address

Professor P. Balaram, delivering the annual day address

Professor Alok Dhawan, Director, CSIR-IITR presenting the memento to Professor P. Balaram

Professor Alok Dhawan, Director, CSIR-IITR, presenting the memento to Dr Rakesh K. Mishra

Staff members of the CSIR-Indian Institute of Toxicology Research recognised for their distinguished services to the Institute

Glimpses of cultural evening

5th International Toxicology Conclave

A two day International Toxicology Conclave was organized at CSIR–Indian Institute of Toxicology Research, Lucknow during December 05-06, 2020, as a part of Annual day celebrations.

In his presidential remark, Professor Alok Dhawan, Director, CSIR – Indian Institute of Toxicology Research, described the genesis of ITC and said that during its more than five decades of service to the nation, CSIR – IITR has been tirelessly working towards meeting the aspirations of industry while also serving the society. In the recent past, a need was felt for greater industry-academia interaction and that was the trigger for the first ITC in 2015. Inaugurating the conclave, Professor Pramod Tandon, CEO, Biotech Park, Lucknow reiterated the fact that CSIR – IITR has an extremely vital role to play in the area of abating pollution and developing remediation measures to tackle the current scenario. Research driven initiatives are the need of the hour to ensure food safety and availability of safe food for the generations to come. Guest of honour for the day, Professor SK Barik, Director, CSIR-National Botanical Research Institute congratulated the organizers on the extremely relevant focus areas for ITC-2019 and said that in this day and age of data driven strategies leveraging the benefits of data sciences for improving human health is vital. Dr D Parmar, Chief Scientist, CSIR – Indian Institute of Toxicology Research again welcomed the gathering, Dr R.Parthasarathi, Principal Scientist, CSIR – IITR briefed about the ITC-2019. He explained regarding this edition of the conclave, in which experts from academia, industry and regulatory bodies will deliberate on topics in the following niche areas of toxicology:

- Food Safety for the Future
- Influx of Data Science in Toxicology and Health
- Abating Pollution and its Remediation

Finally, Dr N Manickam, Senior Principal Scientist, CSIR – IITR and Chairperson, Organizing Committee, ITC-2019 proposed the vote of thanks.

The first session on Day 1 of the conclave focused on "Food Safety for Future". Dr Sanjay Kumar, Director CSIR – Institute of Himalayan Bioresource Technology delivered the key note address which was followed by lectures on Computational gastronomy: Leveraging artificial intelligence for data-driven food innovations by Dr Ganesh Bagler of IIT Delhi and Food safety: A public health priority by Mr Anoop Kumar Mishra of Reckitt Benckiser Pvt Ltd. Dr M. K. R. Mudiam, Senior Principal Scientist, CSIR – Indian institute of Chemical Technology, Hyderabad,

Professor Alok Dhawan, Professor Pramod Tondon, CEO, Biotech Park and Professor S. K. Barik, Director CSIR-NBRI, inaugurating the two day International Toxicology Conclave at CSIR-IITR

Fifth International Toxicology Conclave

apprised the audience on the Newer analytical strategies in food safety management system while Dr Mahejibin Khan of CSIR-Central Food Technology Research Institute, Mysore cautioned the scientific gathering on the threat to food safety and public health due to anti microbial resistance. The Entrepreneurs forum saw active participation from Keeros Foods Pvt Ltd, Nutriplate India and Delmos Research. The second session of the day highlighted the nuances of using data and technology tools to alleviate toxicity and promote human health. Dr Subramanian from CSIR – Central Leather Technology Research Institute, Chennai highlighted the advantages of machine learning strategies for toxicity prediction and Dr Chakrabarti from CSIR – Indian Institute of Chemical Biology, Kolkata spoke about big data and AI based diagnostic and prognostic tools. This was followed by a presentation on the Global burden of disease by Dr C Keshav Chandran, CSIR – IITR and the role of AI and data science in revolutionizing drug discovery by Ms Anvita Gupta of AIGen Therapeutics. The panel discussion at the end of each session highlighted the key action points and take-aways from the scientific presentations.

Professor Pramod Tondon addressing the delegates

"Waste management, air pollution, environmental safety and remediation measures". These were the key topics of deliberations on the second day of the 5th International Toxicology Conclave. Initiating the discussions during the session on "Abating pollution and remediation (AURA)", Shri Manoj Kumar Singh, IAS, Project Director, State Mission for Clean Ganga, Government of Uttar Pradesh spoke about the initiatives being undertaken under the Namami Gange Mission. The first lecture on "Integrated Municipal Solid Waste Management and Remediation Measures" by Dr B Chakradhar of Ramky, Enviro Services Pvt Ltd highlighted the enormous scale of the solid waste

Professor S. K. Barik, Director CSIR-NBRI addressing the delegates

Session speakers at the 5th International Toxicology Conclave (ITC-2019)

Dignatories at the ITC-2019

generation in the country today. Its high time that remediation measures are undertaken on a war footing, lest the problem becomes unmanageable, he said. In the next lecture on Green chemistry and green engineering principles to fight chemical pollution, Dr C Nandi from Corporate R & D, NOCIL opined that using environmental practices in all that we do is the only way forward. Dr Ashutosh Tandon of Unnao Distillery and Dr Udit Chauhan from Micronz Incorporation shred their experiences in Waste water treatment using effluent treatment plants and bio-augmentation respectively. This was followed by a presentation by Dr S. C. Barman, Chief Scientist, CSIR – IITR on the institute's initiatives over the last several decades in air pollution monitoring and environmental safety.

Dr Anita Bhatnagar Jain, IAS, Additional chief Secretary, UP, addressing the audience

Professor Alok Dhawan presenting memento to Shri Manoj Kumar Singh, IAS

Curtains came down on the two day Toxicology Conclave with the valedictory in the evening, chaired by Ms Anita Bhatnagar Jain, IAS, Additional Chief Secretary, Govt of Uttar Pradesh. Awards were also given to the participants Mr. Aditya Kumar, Ms. Keerti Gupta, Ms. Shweta Singh Chauhan, Mr. K.T Vishnu Satyan, Ms. Deeksha Singh, and Ms. Deepshi Chaurasiya for best oral presentations and the best posters that were displayed during the conclave.

Poster presentation by the students at the ITC-2019

Group photo with delegates and organizers at the 5th International Toxicology Conclave (ITC-2019)

Dr Anita Bhatnagar Jain, Guest of Honour, Professor Alok Dhawan, Director CSIR-IITR, Dr N Manickam, Dr R. Parthasarathi, and Dr. Sandeep Sharma with the winners of the Poster Presentation

National Science Day Celebration

"Be Stubborn about your Goals, but flexible in your methods" This was the "Take Home Message" of the National Science Day Lecture delivered by Dr Swati Subodh as a part of the National Science Day 2020 celebrations at CSIR-Indian Institute of Toxicology Research (CSIR – IITR). In her lecture titled, "An atypical journey", Dr Subodh described her journey as a scientist-entrepreneur in the field of biotechnology. Leveraging her expertise in genomics she pursues her passion of developing sustainable solutions for accessible & affordable healthcare through her foundation, 1Million for 1 Billion. Dr Swati, a firm believer in translational science research, narrated a few success stories of the projects undertaken by the Foundation. Earlier, in his Welcome address, Dr D. Kar Chowdhuri, Chief Scientist, CSIR – IITR and Chairman, Organizing Committee, spoke about the genesis of Science Day celebrations in the country. India celebrates the National Science Day on 28th February every year to commemorate the discovery of the Raman Effect by Nobel laureate and Indian Physicist Sir Chandrashekhara Venkata Raman on 28th February 1928.

The potential of any scientific discovery / invention is only realized when it contributes towards fulfilling human needs and alleviating obstacles hindering progress of mankind. This fact was reiterated by Shri Nimish Kapoor, Scientist 'E', Vigyan Prasar, New Delhi. In his address, he said that this has been the bedrock on which Vigyan Prasar was established with the primary objective to popularize science, improve science communication and build institutional networks. The celebrations include a two day work shop on science communication being organized by Vigyan Prasar at CSIR-IITR.

Delivering the presidential Address, Professor Alok Dhawan, Director CSIR – IITR opined that Science begins at home and women have been contributing to science since time immemorial. There are several success stories of women achievers in Science, he said.

Day two of the National Science Day 2020 celebrations at CSIR-Indian Institute of Toxicology Research (CSIR – IITR), saw two lectures by Professor Shubha Tole, Professor and Principal Investigator, Tata Institute of Fundamental Research, Mumbai. In her first lecture, Dr Tole very lucidly described the intricate processes and circuits in the brain that decides how one perceives what is presented. In her second lecture, Professor Shubha Tole described her experiences as a Woman in Science and opined that the absence of gender neutrality / equality in any profession stems from the cultural practices in society.

Earlier, in his Welcome address, Dr D. Kar Chowdhuri, Chief Scientist, CSIR – IITR and Chairman, Organizing Committee, reiterated the fact that it was indeed a unique opportunity for the institute to host two eminent woman scientists for the National Science Day celebrations with the theme on "Women in Science". Delivering the presidential Address, Professor Alok Dhawan, Director CSIR – IITR opined that women's tryst with science is a daily occurrence, beginning at home itself. He also emphasized that, it is imperative that world over equal opportunities be created to ensure gender equality. Dr Ravi Ram K, Principal Scientist, CSIR – IITR and Convener, Organizing Committee, proposed the vote of thanks.

A two day exhibition showcasing the cutting edge research and technologies developed by the institute and a work shop on science communication being organized by Vigyan Prasar at CSIR-IITR was inaugurated on February 28, 2020. The event was coordinated by Dr. Kailash Chandra Khulbe, Senior Principal Scientist, Head Research Planning & Business Development and Dr. R. Parthasarathi Principal Scientist CSIR-IITR. The exhibition and the institute were open for students and common citizens to visit the laboratories and learn about the accomplishments of the institute. More than 200 students from city based schools and colleges visited the laboratories of the institute and also interacted with the scientific staff.

Professor Shubha Tole from Tata Institute of Fundamental Research, Mumbai, delivering the lecture on the "Intricate processes and circuits in the brain".

Professor Alok Dhawan, Director, CSIR- IITR, delivering the presidential address

Professor Alok Dhawan, Director, CSIR-IITR, presenting memento to Professor Shubha Tole

L-R: Dr Ravi Ram Kristipati, Professor Alok Dhawan, Professor Shubha Tole, Dr Sanghamitra Bandyopadhyay and Dr D. Kar Chowdhuri

Panel discussion among dignitaries on the occasion of National Science Day

National Technology Day 2020

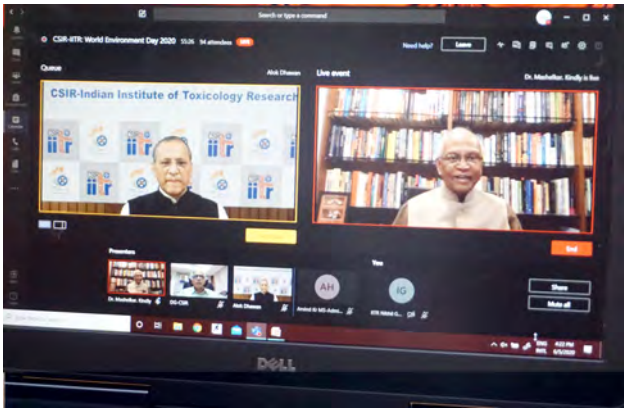
Every year, 11th day of May is celebrated as the National Technology Day, as India successfully tested nuclear bombs in Pokhran on May 11, 1998. The celebrations highlight the important role of technological innovations in our daily lives and encourage students to embrace Science as a career option. The event also highlights the significant milestones of our scientists and engineers in the field of science and technology.

CSIR-Indian Institute of Toxicology Research (CSIR-IITR), Lucknow celebrated the National Technology day with all students, staffs, and scientists through CSIR-IITR's social networking platform. In the opening remarks, Professor Alok Dhawan, Director, CSIR-IITR, highlighted the contributions of CSIR on advancement of science and technology in the country. The 'Technology Day Lecture' was delivered by Professor Thalappil Pradeep, Institute Professor and Professor of Chemistry, Department of Chemistry, Indian Institute of Technology Madras, a pioneer in the area of molecular materials and surfaces. Keeping in mind the present situation, he delivered an intriguing lecture on entitled "Innovations in academic institutions during and after the pandemic". Expressing his views on the occasion, he said that looking at the pandemics of past, science and technology has always provided the solution. He added that "the world today needs sustainable solutions such as sustainable livelihood, food, new packaging material, self-contained homes with more focus on health". The other side of the coin is that during the crisis situation, fundamental human values have been strengthened. People became united and collectivism has increased. In the closing remarks, Professor Alok Dhawan, Director CSIR-IITR urged the student community to convert their passion into their purpose and eventually into their profession. He added that "Indian scientific community is thriving hard to culminate this pandemic disease and expressed hope that with the collective efforts the situation will improve soon".

Professor Thalappil Pradeep, delivering the "Technology Day lecture". Professor Alok Dhawan highlighting the contribution of CSIR on advancement of science and technology in the country

World Environment Day - Reimagining and Reinventing A Post-COVID World

Nature's biodiversity and its contribution to the well being of mankind is our heritage and it is imperative on our generation that we offer the same to future generations to come. However, over the years, nature's safety net has been stretched to breaking point and the diversity of ecosystems and the numerous benefits we derive from it are fast declining at an alarming rate. However not all is lost and there is still time to make a difference. The need of the hour is to "re-imagine and reinvent" at every level from local to global. Transformative change is the way ahead to ensure that nature is restored, conserved and used sustainably. This was the theme of the 24th Dr C. R. Krishnamurthy Memorial Oration delivered as a Webinar by Padma Vibhushan Dr R. A. Mashelkar, FRS, National Research Professor and Former Director General, Council of Scientific and Industrial Research (CSIR) during the World Environment Day Celebrations at CSIR-Indian Institute of Toxicology Research (CSIR-IITR) Lucknow. The current global pandemic is a wakeup call to make such a change; a fundamental, system-wide reorganization across technological, economic and social factors, he said. Presiding over the function, Dr Shekhar C. Mande, Director General CSIR and Secretary, DSIR, Ministry of Science and Technology, Government of India highlighted the contributions made by CSIR towards a safer and secure post-Covid world. Sharing his thoughts, Professor Alok Dhawan, Director, CSIR-IITR urged the scientific community to redouble their efforts in making the world a better place. The institute also released the reports on Pre Monsoon Assessment of Ambient Air Quality of Lucknow City and Gomti Water quality assessment during lockdown period.



Padma Vibhushan, Dr R. A. Mashelkar, FRS, National Research Professor and former Director General CSIR, delivering the 24th Dr C. R. Krishnamurthy memorial oration through webinar on the World Environment Day

Hindi week organized at the Institute from 14th-20th September, 2020

The online inauguration ceremony of Hindi Week was organized on 14 September 2020 at CSIR-Indian Institute of Toxicology Research (CSIR-IITR). On the occasion director of the Institute, Professor Alok Dhawan, while addressing all the scientific, technical and administrative staff and research students, said that today is a very important day. Hindi was accepted as the official language of the Union on 14 September 1949. Official Language Hindi is a very rich and strong language. Use maximum Hindi in all meetings, scientific discussions, day to day work. Scientific work being done in the institution should be accessible to the common people through the simple Hindi language, so that the common people can get the benefit of scientific achievements. He informed the staff about the remarkable achievements of the Institute in the field of Official Language Implementation and said that our Institute is the only scientific institute in 'A' region, which has been awarded the highest prize Rajbhasha Kirti second prize for the year 2019-20 for home journals from Government of India, Ministry of Home Affairs for 31 and 32 volume of 'Vishvigyan Sandesh', year 2019-20, the Editorial board deserves congratulations. The institute received "Third" prize in northern region-2 (Uttar Pradesh and Uttarakhand) under the Regional Official Language Awards for the year 2018-19 by the Government of India, Ministry of Home Affairs, Department of Official Language, among three thousand offices having more than 50 staff. Recently, Government of India, Ministry of Home Affairs, Department of Official Language, Town Official Language Implementation Committee, Lucknow (Office-3) gave First prize for official work in Official Language Implementation in the Institute and Official Language Magazine 'Vishvigyan Sandesh' volume-31, Year 2019-20 received second prize. In the year 2018, the book 'Vishvigyan Anusandhan ke Naye Aayaam' was published in Hindi on the research work of the institute. On Hindi day, we should pledge to work in official language as much as possible. During Hindi week 14-20 September, 2020

Professor Alok Dhawan, Director, CSIR-IITR, and participants during the Hindi week ceremony organized from 14 to 20 September, 2020

everybody should participate in various competitions such as Essay, Debate, Hindi knowledge of non-Hindi speaking, poetry / story writing, translation, presentation, quiz.

On 21st September, 2020, Hindi Week online prize distribution and closing ceremony was organized. On this occasion, director of the Institute, Professor Alok Dhawan while addressing all the scientific, technical and administrative staff and research students through webinars said that the program has been organized in best possible way during Covid. All staff should do maximum work in Official Language Hindi. As a result of the efforts of all of you, despite being a scientific institute, the institute has got the Official Language Kirti Award at the national level by the Government of India, Ministry of Home Affairs, Department of Official Language, Regional Rajbhasha Puraskar at the state level and many times awards have been received at the city level in the field of total official language implementation and publication of Hindi magazine. Significant progress has been made in the field of Official Language Implementation in the Institute. The Institute currently occupies the first position in the field of Official Language Implementation in the Town Official Language Implementation Committee (Office-3), Lucknow. A large number of scientific, technical and administrative staff and research students participated in the competitions organized during Hindi week, which shows their dedication towards the official language, in future everybody must participate in all Hindi competitions, which will increase their confidence. Together we have to take forward the implementation of Official Language. He further said that the scientific work of the institution should be accessible to the common people in simple Hindi language, so that the common man will be aware about the benefits of scientific

CSIR-IITR staff members and scholars participating in Hindi week competitions

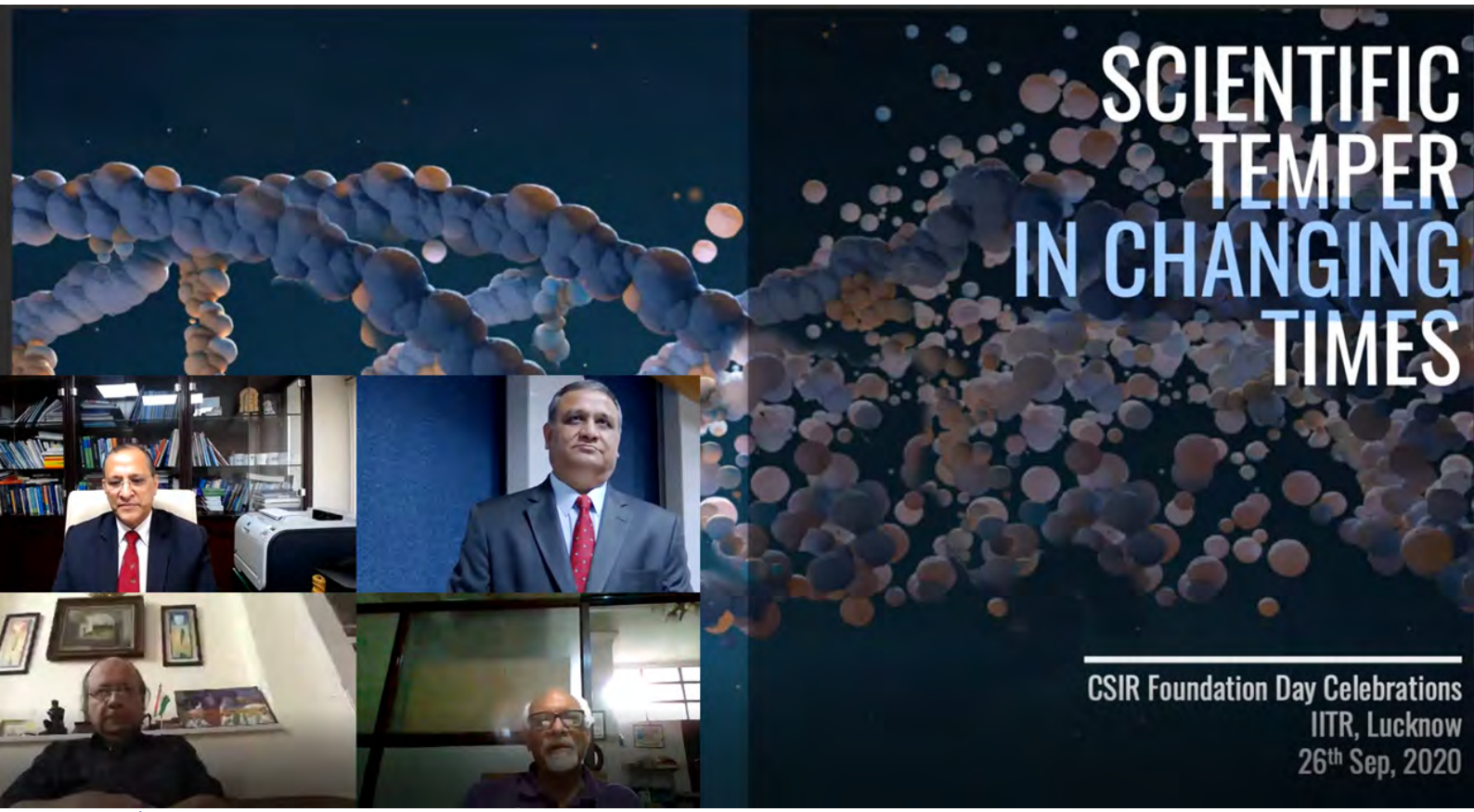
achievements. The book 'Vishvigyan Anusandhan ke Naye Aayaam' published in Hindi on the research work of the institute in the year 2018 is a unique example. In the Institute for the past several years, regular national and international scientific seminars in Hindi on topics related to the general public provide an opportunity for dialogue in Hindi. Public has benefited from the publication of many brochures and books in Hindi on subjects related to them. The publication of the annual report of the institute in Hindi is also an effort in this direction, so that people can get information about research work of the institute in Hindi. We should use the official language as much as possible in all the functions of the institute. During Hindi week 14th-20th September 2020, 31 prizes in 9 competitions including essay, debate, Hindi knowledge of non-Hindi speaking, composition of poetry / story, translation, presentation etc. alongwith 11 prizes for work in Hindi were awarded under the incentive scheme. Shri Chandra Mohan Tiwari, Hindi officer was convener of the function. Shri K.P. Sharma, Controller of administration proposed vote of thanks.

CSIR Foundation Day Celebration

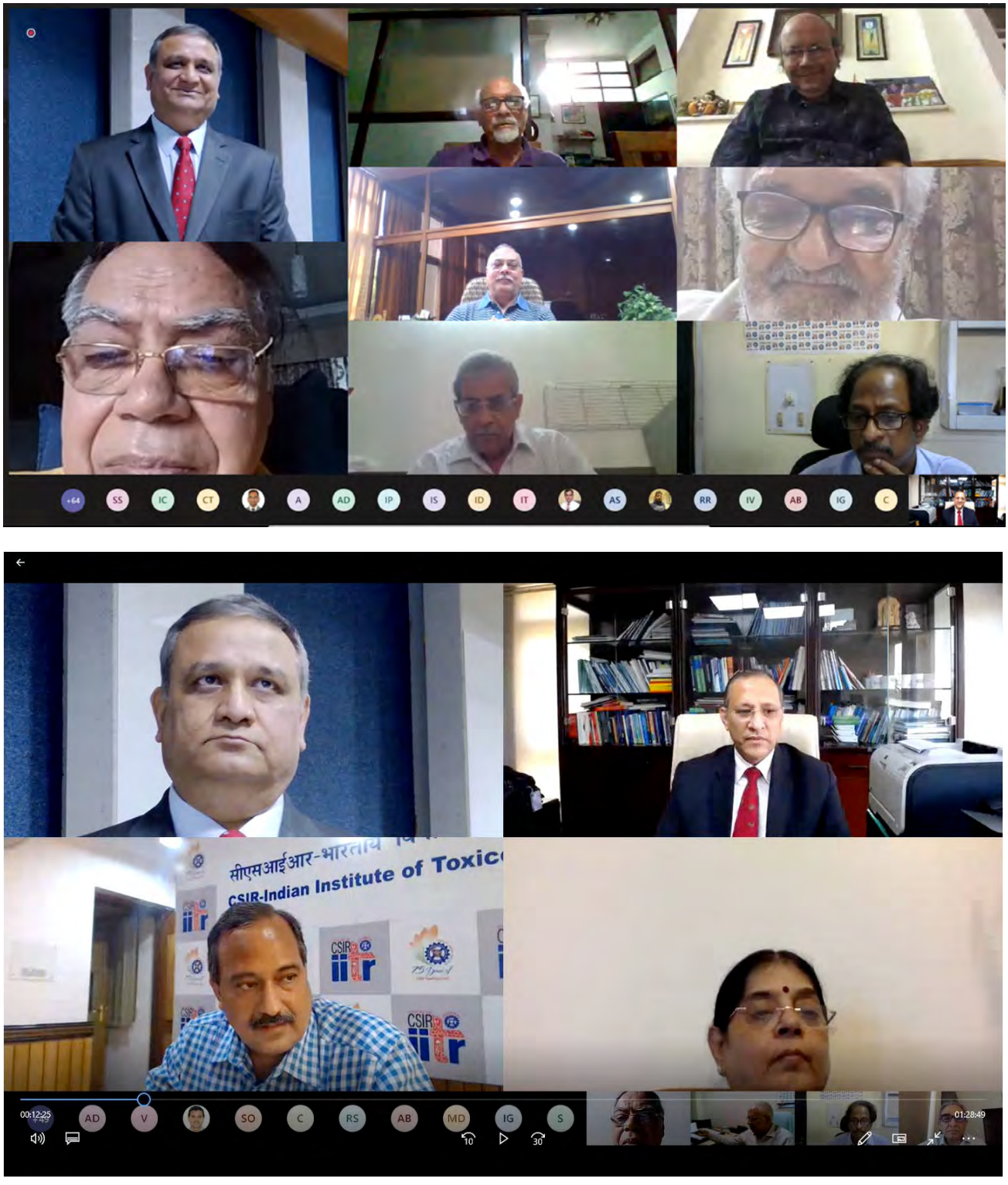
The entire world is currently going through a tumultuous period with the scourge of the Covid-19 global pandemic spreading far and wide. History is replete with numerous examples of how Science has improved the very existence and standard of living over centuries. In a country as large as ours, a strong foundation laid on Science and Technology is essential to ensure better lives to a billion plus people. Echoing similar thoughts, Dr Sanjay Singh, CEO Gennova Biopharmaceuticals Limited, Pune delivered the CSIR Foundation Day Lecture titled, "Scientific Temper in Changing Times". He was speaking at the 79th Foundation Day Celebrations of The Council of Scientific and Industrial Research at CSIR – Indian Institute of Toxicology Research (CSIR-IITR) on September 26, 2020. Recalling the words of the first Prime Minister of the country, Pandit Jawaharlal Nehru, he said that the search for new knowledge and capacity to challenge pre-conceived notions in the face of new evidence is key to meet the unmet needs of the country, towards making a self reliant India, the atma nirbhar Bharat. Going by these lines, He said that Gennova Biopharmaceuticals is currently working towards HGC019, a mRNA vaccine as a preventive and protective measure against COVID-19.

79th Foundation day celebrations of CSIR organized in virtual mode

The celebrations were in virtual mode given the pandemic situation and several senior members of the scientific community, former Director-General and former Directors of CSIR Institutions, including Professor Samir K Brahmachari, Former Director General, CSIR; Dr VP Kamboj, Former Director, CSIR-CDRI; Dr PK Seth, Former Director, CSIR-IITR; Dr Abhay Deshpande, Global Director, Innovation & Strategy Jai Research Foundation; Dr RC Srimal, Former Director, CSIR-IITR; and Dr MK Bhat, Director, NCCS Pune graced the occassion. Dr



Dignatories at the virtual celebration of CSIR foundation day



Dignatories at the virtual celebration of CSIR foundation day

Professor Alok Dhawan, Director, CSIR-IITR, presiding over the function

Professor Alok Dhawan, Director, CSIR-IITR felicitating employees of the institute who have retired from service in the last one year

Devendra Parmar, Chief Scientist, CSIR-IITR and Chairperson, Organizing Committee, welcomed the gathering and introduced the speaker.

The function was presided over by Professor Alok Dhawan, Director CSIR-IITR. In his remarks, Professor Dhawan said that the role of CSIR in the battle against the global pandemic of Covid-19 has been phenomenal with contributions in different spheres like diagnostics, treatment, hospital equipment, supply chain, genome sequencing etc, to name a few. He also mentioned that the Summer Training Programmes at CSIR Laboratories are a much sought after activity among the student community at large. In these challenging times, CSIR-IITR, along with sister laboratories successfully conducted the Summer Research Training Programme – 2020 (SRTP-2020) for 75 students in the online mode, he said. The Institute also felicitated its employees completing 25 years of service and those who superannuated in the previous year. Prizes were also given away to children of CSIR-IITR employees who have excelled in academics during the previous year. Dr Ravi Ram Kristipati, Principal Scientist, CSIR-IITR and Convener of the programme delivered the vote of thanks.

Research Council (up to September 2020)

Chairman

Professor Yogendra Kumar Gupta
Former Head, Department of Pharmacology,
All India Institute of Medical Sciences,
Ansari Nagar, New Delhi

Members

Dr Boindala Sesikeran
Former Director,
National Institute of Nutrition,
Hyderabad, Telengana

Dr Prakash Amrut Mody
Chairman & Managing Director,
Unichem Laboratories Limited,
Unichem Bhawan Prabhat Estate,
Off S.V. Road, Jogeshwari (West)
Mumbai, Maharashtra

Dr Nilima A. Kshirsagar
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ICMR, Govt. of India,
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Indian Institute of Technology, Bombay,
Powai, Mumbai, Maharashtra

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Dr Anil Wali
Managing Director,
Foundation for Innovation & Technology,
Transfer Indian Institute of Technology,
Delhi
Hauz Khas, New Delhi

Dr Rakesh Kumar Mishra
Director,
CSIR-Centre for Cellular & Molecular
Biology,
Uppal Raod, Hyderabad, Telengana

DG's Nominee

Professor Saroj Kanta Barik
Director,
CSIR-National Botanical Research Institute,
Rana Pratap Marg,
Lucknow, Uttar Pradesh

Sister Laboratory Nominee

Dr Rakesh Kumar
Director,
CSIR-National Environmental Engineering
Research Institute,
Nehru Marg, Nagpur, Maharashtra

Agency Representative

Dr Shailja Baidya Gupta
Advisor/Scientist G,
International Cooperation,
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Director

Professor Alok Dhawan
CSIR-Indian Institute of Toxicology
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Lucknow, Uttar Pradesh

Member Secretary

Dr D. Kar Chowdhuri (till 31st Jan 2020)
Chief Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secratory

Dr Ravi Ram Kristipati
Principal Scientist
CSIR-Indian Institute of Toxicology Research
Vish Vigyan Bhavan, 31 Mahatma Gandhi Marg
Lucknow

Research Council (September 2020-2023)

Chairman

Dr C.M. Gupta
Former Director, CSIR-CDRI
Institute of Bioinformatics and Applied Biotechnology
Biotech Park, Electronic City, Phase-I
Bengaluru

External Members

Dr N. Bhaskar
Advisor
Food Safety and Standards Authority India
FDA Bhawan, Near Bal Bhavan Kotla Road
New Delhi

Dr Asha Kishore
Director
Sree Chitra Tirunal Institute for Medical Sciences
& Technology Trivandrum
Thiruvananthapuram

Dr Mukul R. Jain
President
Head, Nonclinical Research & Development
Test Facility Management - GLP
Zydus Research Centre
Cadila Healthcare Limited
Sarkhej-Bavla N.H. No. 8A, Moraiya, Ahmedabad

Dr Sanjay Singh
Chief Executive Officer
Gennova Biopharmaceuticals Limited
Plot No. P-1 P-2, IT-BT Park, Phase-II,
M.I.D.C. Hinjwadi
Pune

Dr Abhay Deshpande
Director
Global Innovation & Strategy, JRF Global
Jai Research Foundation
N. H. No. 48, Near Daman Ganga Bridge
Valvada

DG's Nominee

Professor Dayananda Siddavattam
Department of Animal Biology, School of Life Sciences
University of Hyderabad
Prof. C.R. Rao Road
Gachibowli, Hyderabad

Sister Laboratory Nominee

Dr Tapas K. Kundu
Director
CSIR-Central Drug Research Institute
Sector 10, Jankipuram Ext.
Sitapur Road
Lucknow

Agency Representative

Dr Mohd. Aslam
Adviser (Scientist 'G')
BIRAC Department of Biotechnology
6-8th Floor, Block 2 CGO Complex
Lodhi Road, New Delhi

Director

Professor Alok Dhawan
Director
CSIR-Indian Institute of Toxicology Research
Vish Vigyan Bhavan, 31 Mahatma Gandhi Marg
Lucknow

CSIR Hqrs. Invitee

Dr Vandana Bisht
Principal Scientist
Innovation Management Directorate
Council of Scientific and Industrial Research
Rafi Marg, New Delhi

Member Secratory

Dr Ravi Ram Kristipati
Principal Scientist
CSIR-Indian Institute of Toxicology Research
Vish Vigyan Bhavan, 31 Mahatma Gandhi Marg
Lucknow

Management Council

Chairman

Professor Alok Dhawan
Director,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Members

Professor Saroj Kanta Barik
Director,
CSIR-National Botanical Research Institute,
Rana Pratap Marg,
Lucknow, Uttar Pradesh

Dr Aditya Bhushan Pant
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Kailash Chandra Khulbe
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Neeraj Kumar Satija
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Alok Kumar Pandey
Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Gyanendra Mishra
Controller of Finance & Accounts,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secretary

Dr Prem Narain Saxena
Principal Technical Officer,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Shri K. Prasad Sharma
Controller of Administration,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Management Council (w.e.f. 1.1.2020 to 31.12.2021)

Chairman

Professor Alok Dhawan
Director,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Members

Professor Saroj Kanta Barik
Director,
CSIR-National Botanical Research Institute,
Rana Pratap Marg,
Lucknow, Uttar Pradesh

Dr Kailash Chandra Khulbe
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Devendra Parmar
Chief Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Vikas Srivastava
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr R. Parthasarathi
Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Sri Ram Narayan
Senior Technical Officer,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Smriti Priya
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Gyanendra Mishra
Controller of Finance & Accounts,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31, Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secretary

Shri K. Prasad Sharma
Controller of Administration,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Institutional Complaint Committee for Sexual Harassment

Chairperson

Dr Chetna Singh
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan, 31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Members

Dr Ritu Trivedi
Principal Scientist,
CSIR-Central Drug Research Institute,
Sector 10, Jankipuram Extension,
Sitapur Road, Lucknow, Uttar Pradesh

Dr Vineeta Prakash
Principal,
Isabella Thoburn College,
7, Faizabad Road,
Lucknow, Uttar Pradesh

Dr Vikas Srivastava
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Smriti Priya
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Convener

Dr Preeti Chaturvedi
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan, 31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Institutional Animal Ethics Committee

Chairman

Dr Devendra Parmar
Chief Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

CPCSEA Nominee (External)

Dr Neelam Bala
Main Nominee,
Biological Production Section,
Department of Animal Husbandry,
Lucknow, Uttar Pradesh

Dr Atul Kumar Baranwal
Link Nominee,
In-Charge Animal Facility,
Sanjai Gandhi Post Graduate Institute of Medical Sciences,
Raebareli Road, Lucknow, Uttar Pradesh

Dr Daya Shankar Upadhyay
Scientist from outside the institute,
Senior Principal Scientist & Head, National Laboratory Animal Center,
CSIR-Central Drug Research Institute,
Sector-10, Jankipuram Extension,
Sitapur Road, Lucknow, Uttar Pradesh

Dr Virendra Kumar
Socially Aware Nominee,
Social Worker, Lucknow, Uttar Pradesh

CPCSEA Nominee (from CSIR-IITR)

Dr Mahendra Pratap Singh
(Scientist from different discipline)
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Mahadeo Kumar
(Veterinarian)
Senior Scientist,
Animal Facility,
CSIR-Indian Institute of Toxicology Research,
Gheru Campus, Sarojani Nagar Industrial Area, Lucknow, Uttar Pradesh

Dr Smriti Priya
(Scientist from different discipline)
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secretary

Dr Dhirendra Singh
Principal Scientist,
Member Secretary cum Scientist-in-Charge
Animal Facility,
CSIR-Indian Institute of Toxicology Research,
Gheru Campus, Sarojani Nagar Industrial Area, Lucknow, Uttar Pradesh

Institutional Human Ethics Committee

Chairman

Dr Chandishwar Nath
Former Chief Scientist,
CSIR-Central Drug Research Institute,
3/67, Viram Khand, Gomti Nagar,
Lucknow, Uttar Pradesh

Members (External)

Professor Uday Mohan
Department of Community Medicine &
Public Health,
King George's Medical University,
Lucknow, Uttar Pradesh

Professor O.N. Mishra
Head of Department & Dean, Faculty of Law,
Lucknow University,
Lucknow, Uttar Pradesh

Professor R.K. Singh
Head, Department of Biochemistry,
TSM Medical College & Hospital,
Lucknow, Uttar Pradesh

Shri K.K. Janardanan
2/574, Viram Khand,
Gomti Nagar,
Lucknow, Uttar Pradesh

Shri Vijay Acharya
217, Empire Estate Residency
20 Mall Avenue
Lucknow, Uttar Pradesh

Members (CSIR-IITR)

Dr Devendra Parmar
Chief Scientist,
CSIR-Indian Institute of Toxicology
Research,
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Lucknow, Uttar Pradesh

Dr Vinay Kumar Khanna
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Chetna Singh
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secretary

Dr C. Keshavachandran
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Institutional Biosafety Committee

Chairman

Dr Devendra Parmar
Chief Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg, Uttar Pradesh, India

DBT Nominee

Dr Saman Habib
Senior Principal Scientist,
CSIR-Central Drug Research Institute,
BS-10/1, Sector 10, Jankipuram extension,
Sitapur Road,
Lucknow, Uttar Pradesh

Dr Samir V Savant
Expert Scientist, Sister Laboratory,
Senior Principal Scientist,
CSIR-National Botanical Research Institute,
Rana Pratap Marg,
Lucknow, Uttar Pradesh

Dr Sharad Sharma
Biosafety Officer,
Senior Principal Scientist & Incharge
Toxicology & Experimental Medicine,
CSIR-Central Drug Research Institute,
BS-10/1, Sector 10, Jankipuram extension,
Sitapur Road,
Lucknow, Uttar Pradesh

Dr Vikas Srivastava
Senior Scientist,
CSIR-Indian Institute of Toxicology
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Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Debabrata Ghosh
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member

Dr Smriti Priya
Senior Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Member Secretary

Dr Aditya Bhushan Pant
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Official Language Implementation Committee

Chairman

Professor Alok Dhawan
Director,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

Dr Debapratim Kar Chowdhuri
Chief Scientist
(Upto 31st May 2020)

Dr Devendra Parmar
Chief Scientist

Dr Kailash Chandra Khulbe
Senior Principal Scientist

Shri Nikhil Garg
Senior Principal Scientist

Dr Nateshan Manickam
Chief Scientist

Dr Akshay Dwarakanath
Senior Principal Scientist

Dr. Alok Pandey
Principal Scientist

Shri K. Prasad Sharma
Controller of Administration

Dr Gyanendra Mishra
Controller of Finance & Accounts

Shri K.K. Singh
Section Officer (S&P)

Shri Yogendra Singh
Principal Technical Officer

Shri Raj Kumar Upadhyay
Senior Technical Officer (3)

Smt Rashmi Rathore
Section Officer (G)

Smt Kusum Lata
Private Secretary

Shri Vivek Srivastav
Security Officer

Shri Rakesh Singh Bisen
Senior Technical Officer (3)

Shri Chandra Mohan Tewari
Hindi Officer

Right to Information Act-2005

RTI Act-2005 is being implemented properly in the institute since its inception. Following officials have been designated as per the requirement of the act:

Till April 2020

Dr D. Kar Chowdhuri (till 31st Jan 2020)
Chief Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

First Applellate Authority
CSIR-IITR

Dr Kailash Chandra Khulbe
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan,
31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh

CPIO, CSIR-IITR

Dr Ravi Ram Kristipati
Principal Scientist
CSIR-Indian Institute of Toxicology Research
Vish Vigyan Bhavan, 31 Mahatma Gandhi Marg
Lucknow

ACPIO, CSIR-IITR

May 2020 onwards

Dr Kailash Chandra Khulbe
Senior Principal Scientist,
CSIR-Indian Institute of Toxicology Research,
Vishvigyan Bhawan, 31 Mahatma Gandhi Marg,
Lucknow, Uttar Pradesh
0522-2628228
kckhulbe@iitr.res.in

First Applellate Authority
CSIR-IITR

Dr Yatendra Kumar Satija
Scientist,
CSIR-Indian Institute of Toxicology Research,
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CPIO, CSIR-IITR

Dr Ravi Ram Kristipati
Principal Scientist
CSIR-Indian Institute of Toxicology Research
Vish Vigyan Bhavan, 31 Mahatma Gandhi Marg
Lucknow
raviram@iitr.res.in

ACPIO, CSIR-IITR

Suo-Motto disclosure has been done on institutional website. A total number of 73 applications were received during the year and 72 were responded to. Two appeals were made before the Appellate Authority. On-line returns are being filed as per schedule of the act.

CSIR-IITR Staff

Scientific Staff

Professor Alok Dhawan
Director

Dr Yogeshwer Shukla
Chief Scientist

Dr Devendra Parmar
Chief Scientist

Dr Ganesh Chandra Kisku
Chief Scientist

Dr Nateshan Manickam
Chief Scientist

Dr Vinod Praveen Sharma
Senior Principal Scientist

Shri Nikhil Garg
Senior Principal Scientist

Dr Kailash Chandra Khulbe
Senior Principal Scientist

Dr Ratan Singh Ray
Senior Principal Scientist

Dr Vinay Kumar Khanna
Senior Principal Scientist

Er Altaf Husain Khan
Senior Principal Scientist

Dr Mahendra Pratap Singh
Senior Principal Scientist

Dr Akshay Dwarakanath
Senior Principal Scientist


Dr Devendra Kumar Patel
Senior Principal Scientist


Dr Aditya Bhushan Pant
Senior Principal Scientist


Dr Chetna Singh
Senior Principal Scientist


Dr Chandra Shekhar Nair Kesavachandran
Senior Principal Scientist


Dr Dhirendra Singh
Principal Scientist


Dr Rajnish Kumar Chaturvedi
Principal Scientist


Dr Sanghamitra Bandyopadhyay
Principal Scientist


Dr Ravi Ram Kristipati
Principal Scientist


Dr Alok Kumar Pandey
Principal Scientist


Dr Ramkrishnan Parthasarathi
Principal Scientist


Dr Kausar Mahmood Ansari
Principal Scientist


Dr Raja Gopal Rayavarapu
Senior Scientist


Dr Amit Kumar
Senior Scientist


Dr Anurag Tripathi
Senior Scientist


Dr Abhay Raj
Senior Scientist


Dr Mahadeo Kumar
Senior Scientist


Dr Jyotsna Singh
Senior Scientist


Dr Aruna Satish
Senior Scientist


Dr Vikas Srivastava
Senior Scientist


Dr Nasreen Ghazi Ansari
Senior Scientist

Dr Satyakam Patnaik
Senior Scientist

Dr Debabrata Ghosh
Senior Scientist

Dr Preeti Chaturvedi
Senior Scientist

Dr Sandeep Kumar Sharma
Senior Scientist

Dr Smriti Priya
Senior Scientist

Dr Manoj Kumar
Senior Scientist

Dr Somendu Kumar Roy
Senior Scientist

Dr Anbumani Sadasivam
Senior Scientist

Dr Sheelendra Pratap Singh
Senior Scientist

Dr Neeraj Kumar Satija
Senior Scientist

Dr Pradeep Kumar Sharma
Senior Scientist

Dr Prabhanshu Tripathi
Senior Scientist

Dr Anjenya Ayanur
Scientist

Dr Beena Vamadevan
Scientist

Dr Yatendra Kumar Satija
Scientist

Dr Srikanth Bojjagani
Scientist

Dr Ashish Dwivedi
Scientist

Dr Akhilesh Kumar Yadav
Scientist

Technical Staff


Dr Anvita Shaw
Principal Technical Officer


Dr Prem Narain Saxena
Principal Technical Officer


Shri Yogendra Singh
Principal Technical Officer


Shri Satgur Prasad
Principal Technical Officer


Smt Sumita Dixit
Principal Technical Officer


Dr Pradeep Kumar
Principal Technical Officer


Shri Satya Prakash Dhruva
Senior Technical Officer (3)


Shri Rakesh Singh Bisen
Senior Technical Officer (3)


Shri Ram Narayan
Senior Technical Officer (3)


Shri Sakendra Kumar Purshottam
Senior Technical Officer (3)


Shri Raj Kumar Upadhyay
Senior Technical Officer (3)


Shri Pradeep Kumar Singh
Senior Technical Officer (1)


Smt Kalpana Padalia
Technical Officer


Shri Pankaj Ramji Jagdale
Technical Officer


Shri Sandeep Kumar
Technical Officer


Shri Shyam Kumar Pal
Technical Officer

Shri Syed Ibrahim Meeran
Technical Officer

Shri Jay Shankar
Technical Officer

Shri Puneet Khare
Technical Officer

Smt Nidhi Arjaria
Technical Officer

Shri Sandeep Negi
Technical Officer

Shri Gubla Naga
Venkata Satyanarayana
Technical Officer

Shri Sarfraj Ahmed
Technical Assistant

Smt. Kanchan Sonkar
Technical Assistant

Ms. Deepshikha Srivastava
Technical Assistant

Dr Sumana Y. Kotian
Technical Assistant

Ms. Deepshi Chaurasia
Technical Assistant


Shri Lakshmi Kant
Senior Technician (2)


Shri Kaleem Uddin
Senior Technician (2)


Shri Balkishan
Senior Technician (2)


Shri Satya Ram
Senior Technician (2)


Smt Mumtaz Jahan
Senior Technician (2)


Shri Ashok Kumar Pathak
Senior Technician (2)


Shri Prem Singh
Senior Technician (2)


Shri Parvez Ahmed Khan
Senior Technician (2)


Shri Budhiram Prasad
Senior Technician (2)


Shri Umesh Chandra Srivastava
Technician (2)


Shri Pradeep Shukla
Technician (2)


Shri Pramod Kumar
Technician (2)


Shri Syed Husain Nasir Naqvi
Technician (2)


Shri Jagdish Chandra Awasthi
Technician (2)


Shri Syed Hasnain Nasir Naqvi
Technician (2)


Shri Rajeev Sriavastava
Technician (2)


Shri Chandra Sehkar Singh
Technician (2)


Shri Abhishek Rawat
Technician (2)


Shri Shiv Prakash Rahi
Technician (2)


Shri Sushil Kumar Saroj
Technician (2)

Lab Asistants / Attendants

Shri Hari Ram
Lab Assistant

Shri Naushad Ahmed
Lab Assistant

Administrative Staff


Shri K. Prasad Sharma
Controller of Administration


Dr Gyanendra Mishra
Controller of Finance & Accounts


Smt Kanaklata Mishra
Finance & Accounts Officer


Shri Dharm Raj
Finance & Accounts Officer


Shri Kul Karan Singh
Section Officer (S&P)


Shri Chandra Shekhar Kandpal
Section Officer (F&A)


Smt Rashmi Rathore
Section Officer (G)


Shri Chandra Mohan Tiwari
Hindi Officer


Shri Vivek Srivastava
Security Officer


Shri Mohammad Aslam
Private Secretary


Smt Kusum Lata
Private Secretary


Shri Devesh Chandra Saxena
Asstt. Section Officer (G)


Shri Shitla Shankar Shukla
Assistant Section Officer (G)


Shri Ganga Prasad
Assistant Section Officer (G)


Shri Ajay Prasad
Assistant Section Officer (G)


Shri Pawan Kumar
Assistant Section Officer (G)


Shri Amit Kumar
Assistant Section Officer (G)


Shri Narendra Singh
Senior Secretariat Assistant (G)


Shri Ugra Sen
Assistant Section Officer (F&A)


Shri Anuj Deep
Assistant Section Officer (F&A)


Shri Kusehar Prasad
Assistant Section Officer (S&P)


Shri Manoj Tiwari
Assistant Section Officer (S&P)


Shri Ramendra Kumar
Assistant Section Officer (S&P)


Shri Sandeep Kumar Pal
Junior Secretariat Assistant


Smt Vijya Suresh
Senior Stenographer


Smt Balbeer Kaur
Senior Stenographer


Smt Archna Agarwal
Senior Stenographer


Shri Ram Bilas
Senior Stenographer


Smt Suman Yadav
Senior Stenographer


Shri Tanuj Joshi
Junior Stenographer

Support Staff


Shri Vikas Barua
Group D


Shri Ram Sajeevan
Group D


Shri Rajesh Kumar
Wash Boy


Shri Ravindra
MTS


Shri Sinod Kumar
Bearer


Shri Rajendra Yadav
Bearer

Superannuation

Shri Ram Kumar
Lab Assistant
31.01.2020

Dr Debapratim Kar Chowdhuri
Chief Scientist
31.05.2020

Smt Syamala Das
Senior Technician (2)
31.05.2020

Dr Shyamal Chandra Barman
Chief Scientist
30.06.2020

Shri Mahesh Yaday
Group C/MTS
30.06.2020

Shri Tajuddin Ahmad
Senior Technician (2)
30.06.2020

Shri Abdul Rahman
Technician (2)
31.07.2020

Shri AK Nigam
ASO
31.07.2020

Shri Prem Prakash
Private Secretary
31.08.2020

Shri SL Yadav
Technician (2)
31.08.2020

Shri Brij Mani Pandey
Technician (2)
30.09.2020

Shri Mohan Lal
Senior Technician (2)
30.09.2020

Obituary

CSIR-IITR family deeply mourns the demise of the following members:

Shri Machh Narain
Lab Assistant

Shri Satyendra Kumar Singh
Stores & Purchase Officer

New Appointments

Dr Prabhanshu Tripathi

Dr Prabhanshu Tripathi has joined CSIR-IITR on January 21, 2020 in Food, Drug and Chemical Toxicology Division. Dr Tripathi has done his Ph.D. from CSIR-Institute of Genomics and Integrative Biology, New Delhi in the field of Allergy and Immunology. He was a postdoctoral fellow in University of Chicago, USA (2011-2012) where he has worked on 'Gut microbiome and allergic susceptibility to food antigens' and in University of Gothenburg, Sweden (2013-2015) where he was working on 'activation of type 2 NKT cells by microbial antgens'. He moved back to India in 2016 as a prestigious Ramalingaswami Fellow and joined DBT-Translational Health Science & Technology Institute in Delhi-NCR where he started working on gut microbiome and type 2 diabetes. He has publications in the journals of high repute like European Journal of Immunology, Molecular Immunology, Frontiers in Immunology, Nature Communications, Scientific Reports, PNAS, Free Radical Biology and Medicine etc. He is member of editorial board in various international journals in Immunology. Dr Tripathi has research interests in exploring the role of microbiome in human health and at CSIR-IITR, he is working on 'Toxicant mediated modulation of microbiome and their health consequences'

Dr Sumana Y. Kotian

Dr Sumana Y. Kotian, joined as Technical Assistant in Analytical Chemistry division on January 24, 2020. She is basically from Mysore, Karnataka. Dr Kotian has completed her PhD under the guidance of Prof. K. M. Lokanatha Rai at Department of Studies in Chemistry, University of Mysore. Before joining the institute, she was working as Assistant Professor (C) at Yuvaraja's College, University of Mysore. Her field of expertise is synthesis and characterization of five membered heterocyclic compounds and study of their liquid crystalline properties and biological activities.

Ms. Deepshikha Srivastava

Ms. Deepshikha Srivastava joined Indian Institute of Toxicology Research on January 17, 2020 as a Technical Assistant in HRMS (High Resolution Mass Spectroscopy) facility where she is dealing with the proteomic studies of biological samples. She has done her Bachelor of Sciences from Lucknow university in 2013 and Master of Science in Biochemistry from Banaras Hindu University in the year 2015. She has been awarded with a gold and a silver medal for acquiring highest marks in chemistry and good academic record in B.Sc examinations. She has worked in CSIR-Central Drug Research Institute, Lucknow as a Project Assistant in a project which was also centered to proteomics studies by NMR (Nuclear magnetic resonance) spectroscopy has a good experience in various molecular and biological techniques including biochemical and biotechnology applications.

Ms. Deepshi Chaurasia

Ms. Deepshi Chaurasia joined CSIR-IITR on January 06, 2020 as a Technical Assistant (Group-III). She has received her Bachelor's degree (B.Sc.) in Biological Science in 2012 from Lucknow University. She completed her Masters (M.Sc.) in Biotechnology in 2014 from Banasthali University, Rajasthan. She has worked as a Project Assistant at CSIR-Indian Institute of Toxicology Research (IITR), Lucknow for four years and was involved in the water quality analysis of river Ganga and its tributaries.

Smt. Kanchan Sonkar

Kanchan Sonkar has joined CSIR-IITR on 10th January 2020 as a Technical Assistant Gr III. She has done Master of Science (Environmental Science) from BabaSaheb Bhimrao Ambedkar University, Lucknow.

DST Inspire Faculty/ National Postdoctoral fellows/ Woman Scientists/Project Research Associate

Dr Kavita Seth
DST Woman Scientist

Dr Manisha Mishra
DST Inspire Faculty

Deepti Chopra
National Postdoctoral Fellow

Paramjeet Singh
Research Associate

Pankaj Chowdhary
Research Associate

Vineeta Sharma
Project Research Associate

Abhilasha Kanojia
Project Research Associate

Manisha Bhateria
Project Research Associate

Research Scholars and Project Fellows


Anima Kumari


Anugya Srivastava


Abdul Atiq Siddiqui


Abhishek Gupta


Abhishek Kumar Verma


Abhishek Mishra


Aditya K. Kar


Aditya Kumar


Aditya Pankaj


Ajit Kumar Rai


Akash Kumar


Alika Srakar


Alina Zehra


Amit Manhas


Amrita Singh


Anchal Chauhan


Anees Ahmad


Anil Kumar Singh


Anjali Singh


Ankit Gupta


Ankit Kumar


Ankit Kumar


Annapurna Maurya


Anshika Gupta


Anuradha Singh


Anushka Pandey


Apoorva Saxena


Archana Yadav


Arun Pratap Singh


Ashish Kumar Sonkar


Ashutosh Yadav


Asmita Garg


Asthika Sachan


Balendu Shekhar Giri


C. Yahavi


Chamanpreet Kaur


Charul Rajput


Chetan Singh Rajpurohit


Deeksha Singh


Deepak Kumar Sachan


Diksha Singh


Divya Singh


Durgesh Prasad Mourya


Garima Singh


Gaurav Prajapati


Gayatri Bagree


Hafsa Hashmi


Hamid Kamal


Harshita Pandey


Humaira Ahmad


Indra Dev


Ishrat Jahan Saifi


Jagreeti Singh


Jasleen Kaur


Jitendra Vishwakarma


Juhi Mishra


Julee Verma


Kainat Fatima


Kajal Karsauliya


Kamini Shivhare


Kapil Mandrah


Kavita Dubey


Kavita Koshta


Kavita Krishna


Keerti Gupta


Krishna Gautam


Lavi Rani


Manoj Kumar


Marhaba


Md Imran Ansari


Meetali Sinha


Minal Chaturvedi


Minu Singh


Miratul Fathima


Mithilesh Kumar Mishra


Monika Seth


Musharraf Ali Khan


Nabojit Das


Nawaz Khan


Neeraj Rawat


Neha Gupta


Neha Singh


Nida Moin


Nidhi Sachan


Nirmesh Srivastava


Nitesh Dhiman


Nivedita Maddheshiya


Nupur Mishra


Nuzhat Bano


Onila Lugun


Oyashvi Verma


Pallavi Gupta


Pallavi Srivastava


Pankhi Vatsa


Pawankumar Rai


Pokhraj Sahu


Pooja Yadav


Poorwa Awasthi


Prakrity Singh


Pramod Kumar


Priya Saxena


Radhika Singh


Rafat Malik


Rahul Verma


Raj Kumar Regar


Rajesh Kumar


Ravi Kumar Tiwari


Ravi Singh


Ravindra Singh Thakur


Renu Negi


Renuka Maurya


Richa Singh


Rishabh Rawat


Rohit Kumar Khetan


Sadhna Pandey


Salil Srivastava


Sandeep Kumar


Sangh Jyoti Singh


Sanjay Saini


Sarika Yadav


Saumya Mishra


Saumya Shukla


Saurabh Pal


Saurabh Singh


Saurabh Singh


Saurabh Tiwari


Shagun Shukla


Shambhavi Jha


Shashank Kumar Ojha


Shashyendra Singh Gautam


Shivangi Gupta


Shraddha Pandit


Shreya Dwivedi


Shristee Gupta


Shweta Goyal


Shweta Singh Chauhan


Siddhartha Gangopadhyay


Snigdha Gupta


Soni Prajapati


Srishti Mehotra


Sukhveer Singh


Surabhi Jaiswal


Sushmita Tiwari


Swarnima


Swati Saxena


Talat Ilyas


Triparna Das


Tuba Parveen


Tulika Srivastava


Upasana Pandey


Uzair Ahmad Ansari


Varsha Singh


Varsha Tripathi


Ved Prakash


Veena Jain


Vibha Shukla


Vibha Shukla


Vinay Kumar Shukla


Vinita Verma


Vipin Kr. Yadav


Vishnu Sathyan


Vivek Kumar Gaur


Zeeshan Arif

Staff Strength

(As on 31/10/2020)

Scientific Staff Group IV	51
Technical Staff Group III	27
Technical Staff Group II	22
Lab Assistants/Attendants	03
Adminsitrative Staff	30
Support Staff	07
Total	140

DST Inspire Faculty / Women Scientist / National Post Doctoral Fellow / Research Associate	09
Research Scholars & Project Fellows	194
Total	203

Budget

External Cash Flow (ECF) : (FY 2019-20)

Rs. in Lakhs

Government	1458.561
Foreign	17.434
Industries	123.366
Total	**1599.361**

Government Budget (FY 2019-20) : 6212.687

सीएसआईआर-आईआईटीआर

54वाँ वार्षिक दिवस समारोह

14 नवंबर, 2019

CSIR-IITR

54th Annual Day Celebrations

November 14, 2019

Group Photograph

Staff members of the CSIR-Indian Institute of Toxicology Research recognised for their distinguished services to the Institute

Front cover page figure details

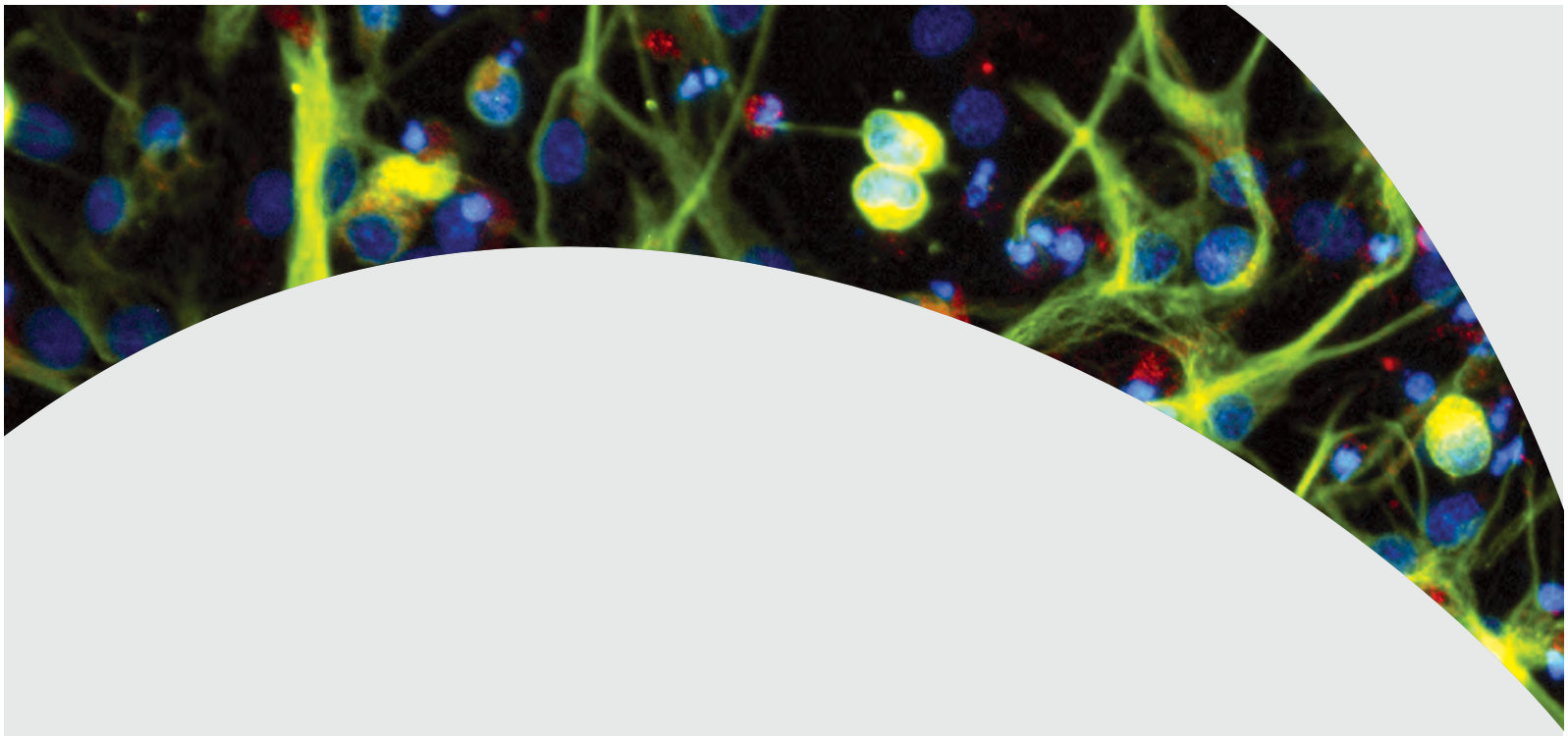
Immunofluorescence image of 2 months old Balb/c mouse brain in coronal section, co-immunostained for oligodendrocytes myelin sheath and neurons using myelin basic protein and Neurofilament heavy polypeptide respectively. Green color indicates myelin basic protein and red is specified for Neurofilament heavy polypeptide while DAPI (blue) is used as a nuclear stain. The yellow color indicates overlapping of Myelin Basic Protein (Green) and Neurofilament heavy polypeptide (Red) suggesting the wrapping of oligodendrocyte myelin sheath around the neurons.

Contributors: Shaivya Kushwaha and Dr Debabrata Ghosh

Back cover page figure details

The merged image shows co-immunolabelling of Amyloid precursor protein (APP: Red) with β-tubulin III (neuronal marker) (Green) and co-staining with DAPI (Blue) in the rat primary hippocampal neurons.

Contributors: Asmita Garg and Dr Sanghamitra Bandyopadhayay



सीएसआईआर-भारतीय विषविज्ञान अनुसंधान संस्थान

CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH

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