



Facilities, Technical Services Offered & Other Activities



CSIR-INDIAN INSTITUTE OF TOXICOLOGY RESEARCH



In the service to the nation
for 48 years
our motto-

***“Safety to Environment &
Health and Service
to Industry”***

The laboratory through its scientific expertise provides complete facilities for toxicological research, environmental and health risk assessment as well as analysis and testing services conforming to Good Laboratory Practices using NABL and international guidelines employing latest test systems, bio-markers, analytical instruments and mathematical models.

Services Offered

- Health and Environmental Monitoring
- Consumer Safety
- Toxicity Testing
- Analysis of chemicals
- Information Database
- Environmental Impact Assessment
- Consultancy
- Hazardous Waste Disposal
- Environmental Management Plan
- Health Status of Occupational Workers
- Preparedness of Disaster Management

Technologies Developed/Available

- Water Analysis Kit
- Mobile Laboratory Van for on spot Water quality analysis
- Argemone Detection Kit for rapid screening of Argemone in mustard oil
- CD-Strip for detection of butter yellow an adulterant in edible oils
- Arsenic Detection Kit

Knowledge Resource Centre (KRC)

CSIR-IITR- Knowledge Resource Centre (KRC) is a hub to access current literature in toxicology and meets the requirements of the scientific fraternity. Presently it has over 30600 information materials of different categories such as books, journals, databases, reports and specific reference materials in print and electronic formats.

During the year, KRC acquired 16 books, 240 bound periodicals, 60 annual reports of various organizations of CSIR consortia and others. CSIR-IITR published 121 research papers during the year. KRC also received 47 Newsletters, both in Hindi and English. The Centre subscribed to 33 foreign (print and online) and 37 Indian journals.

Full text access to journals of 28 publishers was also made available through National Knowledge Resource Consortium (NKRC), formerly CSIR e-journal consortium, which was extensively used by the researchers. Apart from licensed resources, NKRC is also a single point entity that provides its users with access to a multitude of open access resources.

Research, Planning and Business Development

Research, Planning and Business Development Division (RPBD) 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. It also explores the possibilities of business development by establishing liaison with industries, private and public sector undertakings, government organizations, research institutions and universities. Further, it interacts with International Scientific and Technology Affairs Directorate of CSIR and other international and national agencies to organize visits/deputation of scientists under various bilateral exchange programmes. Providing logistic support in the preparation of five year plan, proper management of intellectual material by coordination with the scientists for identification of patentable content of the material and dispatching it to the Innovation Protection Unit of CSIR for execution are the important activities of the division. The division is also responsible for sending replies to parliament questions, prepare audit replies, and arrange meetings of Research Council (RC), Management Council (MC) and other activities related to extramural human resource development. In addition, the division facilitates signing of MOUs/Agreements between the

institute and outside parties related to project activities and training. The division also arranges training of postgraduate students from various universities and official of national and international organizations. Further, it interacts with media to highlight various institutional programmes including research activities.

Biomedical illustration and photography

This division plays an important role in organizing events and showcasing institutional activities. It is well equipped with modern tools for projection and photography viz. computers, digital interactive screen, multimedia, slides and overhead projectors. SLR and digital cameras are also available to facilitate various scientific and societal activities of the institute. It also prepares posters and other display materials required for presentations. The division plays an important role in exhibiting the institutional achievements at various locations in the country.

ENVIS

The Environmental Information System (ENVIS Centre) at CSIR-IITR is a network partner with the focal point at the Ministry of Environment & Forests, Government of India, New Delhi. Established in January 1984 it has been involved in collection, collation and dissemination of information related to toxic chemicals. The ENVIS Website is hosted on secure NIC server (<http://itrcenvis.nic.in/>) and is regularly updated with the information related to environmental, toxicity, and pollution issues. The summary of the work carried out during 1st April, 2012 to 31st March, 2013 is given below:



Snapshot of ENVIS Website (<http://www.itrcenvis.nic.in>)

Databases on ENVIS website:

ToxChem (Toxic Chemicals): This database is a thematic database, which provides information on chemicals under different attributes: uses, properties, symptoms of exposure, antidotes, treatment, toxicity data, precautions, prevention, storage, health risks (if any), hazards to humans and environment and disposal (in case of leak). Information on 50 new carcinogens have been added to the database during 2012-13. Here, a user can search chemicals under different categories such as: Cosmetics, Food Additives, Pesticides, Plastics, Colour and Dyes, Industrial Chemicals and Solvents.

Antidote against Snake and Scorpion Poisoning: This database is very helpful to researchers in evaluation of the chemical constituents of poisons and discovering newer molecules for future drug development. It contains information on medicinal plants with different attributes such as: scientific name, synonyms, common name, family, antidote, constituents and their distribution in India as well as globally.



| Detail of: <i>Amaranthus tricolor</i> as an antidote against Snake / Scorpion bite | |
|--|--|
| SCIENTIFIC NAME | <i>Amaranthus tricolor</i> |
| SYNONYMS | A. gangeticus |
| COMMON NAME | Amaranth, chinese spinach, kharun, selasih bayem, careless weed, bayem, amarantos, amarans, amaranus, pigweed, tampala, Joseph's coat, ala de Perico, marra, African spinach, Surnam spinach, spinach grass, wild beet, wild bite, blede espinoso, careless weed |
| VERNACULAR NAME | Red Amaranth |
| FAMILY | Amaranthaceae |
| ANTIDOTE | Snake-bite |
| PARTS USED | Whole plant |
| HABITAT | A widely cultivated plant, it is not known in a truly wild situation, Cultivated Beds |

Treatment and Antidotes for Chemical Poisoning: This database provides information on antidotes and treatments in case of poisoning with toxic chemicals under different attributes: synonyms, molecular formula, molecular weight, properties, uses, symptoms, antidote and treatment, which is very useful for laboratories and other industrial organizations.

ENVIS Publications:

Newsletters: Every year the centre publishes 4 issues of the ENVIS newsletter. During 2012-13 Volume 19, Number 2, 3, 4 and Volume 20, Number 1 have been published. The topics on which the

newsletters were published are Food Toxicity, Airborne Disease, Nanomaterial Toxicity, Phototoxicity and Occupational Health.

Abstracts of Current Literature in Toxicology: This year Abstracts of Current Literature in Toxicology, Vol.25, No.1 and 2(January- December) 2012-13, was published with 620 abstracts covering various environmental and toxicological topics.

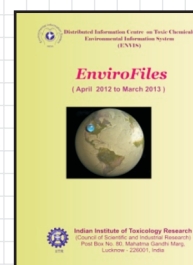
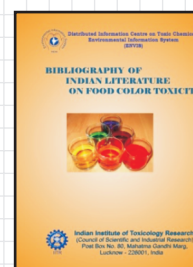
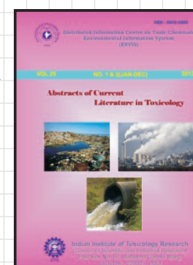
Bibliography: An Annotated Bibliography of Indian literature on Food Colour Toxicity was published covering publications on various aspects with 285 references.

EnviroFiles: Environment, health, science and technology related news, collected from leading newspapers like Times of India, Indian Express, Deccan Herald, Telegraph etc and from many science magazines is updated on the website regularly and published in Enviro Files.

Environmental Information: 107 queries were processed and relevant information was provided to users. Queries processed were mostly related to chemicals and environmental issues particularly toxic chemicals, human health, industry, agriculture, chemical and biochemical processes, pollution & wastes. Users are scientists, researchers, medical doctors, policy planners, NGOs, government departments & many others.

Computer Centre

Computer Centre provides a central computing facility to the staff and students of the institute engaged in R&D and S&T activities which includes development and maintenance of application softwares, web sites and databases. It also provides intranet and internet facilities and maintains a Local Area Network within the campus consisting of more than 400 nodes. A central internet and DTP facility are maintained by the computer centre to cater to the needs of staff and students of the institute. The computer centre also runs the Institute's Video Conferencing Facility with multi-point support (up to 4 sites) in a single video



conference. The VC system is equipped with ISDN and TCP/IP interfaces and can establish conferences with sites equipped with any of these two interfaces. Computer Centre extended its technical support to populate databases which were required to implement various ERP applications under OneCSIR project of CSIR.

Animal Facility

Animal facility of CSIR-IITR is NABL accredited. The following types of studies have been carried out at the animal facility Gheru campus during 2012-13:

Regulatory Toxicology:

- Single dose acute toxicity studies in rats
- 28 day repeat dose toxicity studies in rats
- 90 day repeat dose toxicity studies in rats
- 180 day repeat dose toxicity studies in rats
- Carcinogenicity studies in mice
- Teratogenicity studies in rats
- Primary skin irritation in rabbit
- Mucous membrane irritation in rabbit

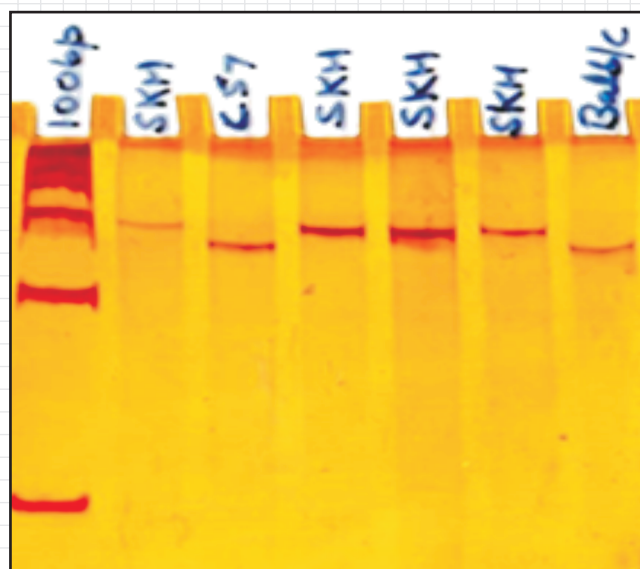
Genetic monitoring of BALB/c mice maintained at Animal Facility, CSIR – IITR

As a quality control initiative, the Animal Facility at CSIR – IITR utilizes Polymerase Chain Reaction (PCR) based technique using microsatellite (D2Mit75, D3Mit54, D3Mit200 and D1Mit171) markers to ensure genetic purity of the breeding colony of Balb/c mice.

Samples for DNA isolated from mouse tails are randomly obtained from the breeding colony and checked using these microsatellite markers. All animals tested produce equal size of amplified band. This equal sized microsatellite-PCR banding pattern confirms the homogeneity in the colony of Balb/c mice.

Genotyping of HR Gene of Mutant Hairless (SKH-1) Mice

Ten pairs of hairless mice (SKH-1 strain) were procured from M/s Charles River Laboratories, USA in April 2012. These mice were maintained as a closed colony mating system and were propagated to support the institutional R & D activities. As a quality control measure genotyping the hairless gene of these mice



PCR genotyping for Hr allele in mice using primers in combination (primer 1 & 3 for SKH and Primer 2 & 3 for Balb/c & C57), L-1: 100 bp ladder, L-2,4,5,6: SKH mice sample, L-3: C57BL/6 and L-7: Balb/c mice sample

| D2Mit75 | D3Mit54 | D3Mit200 | D1Mit171 |
|--|--|--|--|
| <p>Fig 1 (a)</p> <p>Balb/c mice DNA (n=8)</p> <p>Size of product: 106 bp</p> | <p>Fig 1 (b)</p> <p>Balb/c mice DNA (n=4)</p> <p>Size of product: 148 bp</p> | <p>Fig 1 (c)</p> <p>Balb/c mice DNA (n=9)</p> <p>Size of product: 136 bp</p> | <p>Fig 1 (d)</p> <p>Balb/c mice DNA (n=6)</p> <p>Size of product: 155 bp</p> |

using PCR technique is being done. The Hr gene of a hairless mouse strain (SKH-1) is evaluated using three primers (primer 1: GGTCTCGCTGGTCCTTGA, primer 2: TCTGGAACCAGAGTGACAGACAGCTA and primer 3: TGGGCCACCATGGCCAGATTTAACACA). The combination of primers 1 and 3 detects the mutant Hr allele (280 bp) and a combination of primer 2 and 3 detects the wild type Hr allele (250bp). This genotyping technique also facilitates research using immature (pups) SKH-1 mice which otherwise phenotypically resemble Swiss albino mice pups.

Technical and Support Services:

Animal reared and Issued (approximate numbers) during 2012-2013

| Animal | Reared | Issued to IITR | Animals Sold Outside IITR |
|------------|---|---------------------|---------------------------|
| Rat | 3500 | 4000 | 700 |
| Mice | Swiss Albino – 2000 BALB/c – 1500 SKH-1 – 300 | 1500 1600 100 | 600 150 ---- |
| Guinea Pig | 1000 | ---- | 600 |
| Rabbit | 200 | 100 | 100 |

Generation of ECF by sale of animals to other organizations

| Sl. No. | Organization | Amount (Rs) |
|--------------|--|------------------|
| 1. | Non-profit making government organizations | 708390.00 |
| 2. | Profit making private organizations | 24800.00 |
| Total | | 733190.00 |

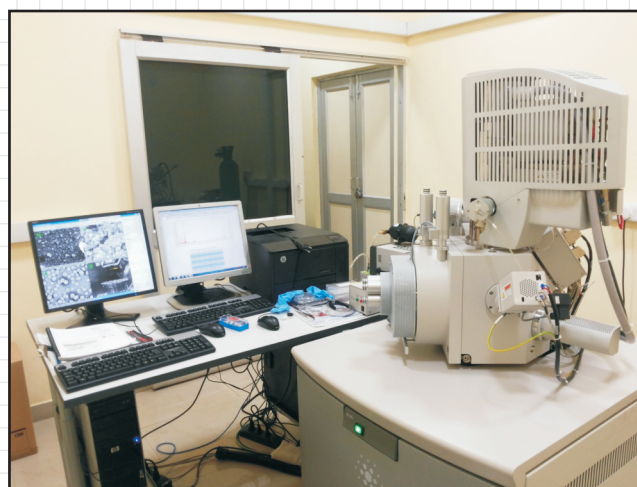
Analytical Chemistry section

Analytical Chemistry section provides centralized analytical facility for in house research activities and also to external organizations. This section is equipped with sophisticated instruments such as AAS, ICP-AES, HPLC, GC-MS/MS. Recently this division has also established the following:

Scanning Electron Microscope (SEM):

Quanta 450 FEG (FEI, The Netherlands) is a high resolution field emission electron microscope being used for imaging and analyzing the topography of biological and material samples. The system is

equipped with EDX (energy dispersive X-ray) used for collecting the back scattered electron images, characterizing and determining the elemental composition of a sample. This is operable at 500V to 30 KV for high resolution. This has wide application in the field of nano technology and nano material sciences in addition to biological sciences. It provides information on grain size and shape, particle size distribution, homogeneity and surface structure. A sputter coater

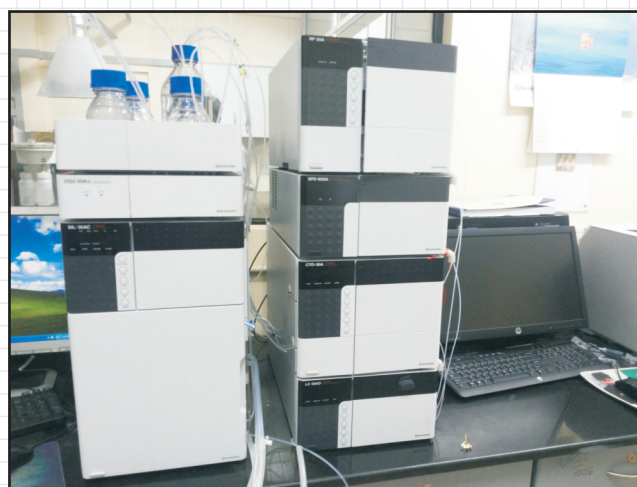


A view of Scanning Electron Microscope (SEM)

and a critical point dryer are also installed for preparation of the samples for SEM.

Ultra High Performance Liquid Chromatograph (UHPLC)

Shimadzu Nexera UHPLC system has been installed in the Analytical Chemistry Section with Photo



A view of Ultra High Performance Liquid Chromatograph (UHPLC)

Diode Array (PDA) and fluorescence detectors. The system has the capability to analyze environmental pollutants and other chemicals with improved resolution and separation.

Liquid Chromatography - Tandem Mass Spectrometer (LCMS/MS)

Quadrupole based ultra performance liquid chromatography - mass spectrometer (API 4000 from

AB Sciex) has been installed to provide ultra trace analysis of organic compounds, pharmaceutical preparations, environmental contaminants, metabolites and conformation of these molecules using SRM (single reaction monitoring) and MRM (multiple reaction monitoring) mode to get better sensitivity up to ppt level.



Liquid Chromatography - Tandem Mass Spectrometer (LCMS/MS)

Human Resource Development

AcSIR Ph.D. Programme at CSIR-IITR

Ph.D. programme in Biological Sciences and Chemical Sciences under the aegis of the Academy of Scientific & Innovative Research (AcSIR) has been initiated at Indian Institute of Toxicology Research-Council of Scientific and Industrial Research. Established in 2011 as an 'Institution of National Importance', the Academy of Scientific & Innovative Research (AcSIR) has adopted the mandate to create and train some of the best of tomorrow's Science & Technology leaders through a combination of innovative and novel curricula, pedagogy and evaluation. AcSIR focuses on imparting instruction and providing research opportunities in such areas as are not routinely taught in regular academic universities in India. AcSIR-IITR Ph.D. Programme is aimed at creating highest quality personnel with cross-disciplinary knowledge in order to provide leaders in the field of toxicology and associated technology and offers exciting opportunities to Masters degree holders (with a valid fellowship such as UGC/CSIR-NET in biological/chemical sciences or any other equivalent fellowship) having a keen sense of scientific enquiry, for pursuing advanced research in the frontier areas of Biological and Chemical Sciences.

As a part of the Ph.D. programme in Sciences, students are required to acquire a total of 20 credits for completion of their degree (12 credits from the course work, 4 credits from Project proposal and Review Article writing and the remaining 4 credits from CSIR-800 project related work). AcSIR-IITR offers following courses in Biological Sciences: Biostatistics, Computation/Bioinformatics, Basic Chemistry, Research Methodology, Communication/ethics/safety, Biotechniques/Instrumentation, Biology of Inheritance, Xenobiotic Interaction and Response, Cell Signaling, Stem cells, regeneration and aging, System Immunology, Seminar Course, Environmental toxicology, Food & Chemical Toxicology, Target organ toxicity, Nanomaterial Toxicology, Neurotoxicology and Genes and Environmental Diseases besides meticulous and thorough project and review article work. The courses offered under Chemical Sciences

are Research Methodology, Analytical Tools and Instrumentation, Advanced Organic Chemistry, Advanced Analytical Chemistry, Advanced Photo Chemistry, Organic Spectroscopy Applications and Mass spectrometry applications along with rigorous project/review article work.

To date, there are forty scientists onboard as potential faculty of AcSIR-IITR. Twenty eight students were enrolled during the January 2011 session of AcSIR. Further, two students joined AcSIR in its August, 2011 session and an additional thirty four students enrolled during 2012 session (twenty in the January 2012 session and fourteen in the August 2012 session). Six more students joined in January 2013 session thus making the total tally of students inducted into the programme as on March 2013 at seventy.

As of today, the January and August 2011 batches of students have successfully completed their Comprehensive Examinations after successfully fulfilling the course requirements and project writing (totalling to 16 credits). Furthermore, the students enrolled in the January 2012 session of AcSIR-IITR Ph.D. programme, have acquired the requisite 16 credits from their course work and project proposal writing. August 2012 session students have also completed their course work.

These students, coming through a rigorous selection process, are the major work force of the institute carrying out research work in areas of national/international importance and societal relevance for their Ph.D. under AcSIR Ph.D. programme.

The database that was specially created for keeping records of the information of all the students and directly generating their Grade Reports has been successfully copyrighted.

The courses offered by IITR under AcSIR Ph.D. programme, their codes as well as credits and the respective course coordinators are listed in Tables 1 & 2.