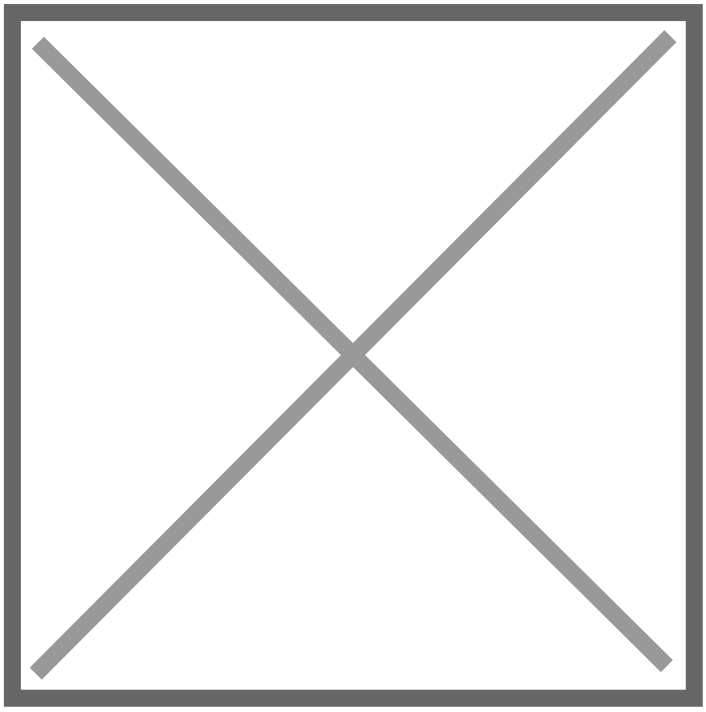
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Unique toxico research lab

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Maintaining reasonable health standards is not an easy task, especially in a country like ours with widespread poverty, poor hygiene, low living standards and the sub-tropical climate which helps disease organisms to thrive effortlessly. In such a scenario, the nation has to develop its own techniques to combat its unique problem. As a part of the solution, mainly to guard the health of industrial and agricultural workers, the Industrial Toxicology Research Centre (ITRC), Lucknow, was set up in 1965 by the Council of Scientific and Industrial Research (CSIR).

The pristine surroundings of the ITRC campus in the heart of Lucknow provide a visitor instant clues to the high quality research work being done in this premier laboratory. Clean water is an essential component of agricultural operations and in a large number of industrial processes. No wonder ITRC has chosen water as one of its theme and a lot of research work is directed at making this valuable resource as clean as possible. And driving the crusade is Dr YK Gupta, director, ITRC, whose firm belief in the youth and innovative ideas is a major motivating factor to the scientists at the centre.

"The basic or primary concern ahead of ITRC is to create a new knowledge base of health and chemicals. It is a unique and important scientific resource in toxicology safety research and testing. In this regard innovative ideas are very much required for research," said Gupta.

The lab has developed a number of devices and techniques to analyze the toxicity of air and water. The scientific expertise of ITRC provides facilities for toxicological research, environmental and health risk assessment and analysis and toxicity testing services conforming to Good Laboratory Practices using national and international guidelines employing the latest test systems, biomarkers, analytical instruments and mathematical models.

About the strengths of the lab, Seth said, "At ITRC, we have a large knowledge base and analytical as well as experimental skills as our big strength. This has been built over the last three decades in the areas of health risk assessment, preventive toxicology, predictive toxicology, environmental toxicology, inhalation toxicology and analytical toxicology. The centre is also equipped with facilities in the field of molecular toxicology and regulatory toxicology. These can be called as one of the most sophisticated infrastructure available in the country."

Elaborating the laboratory's strengths, Dr Kailash Khulbe, scientist, Research Planning and Business Development (RPBD), ITRC, said, "We also organize public awareness camps and outreach programs to spread awareness among the masses. The information is put to practical use by regulators, policy makers and other scientists in industry, government and academies. In this way ITRC is acting as a bridge between all these sections of the society."

Khulbe added, "The laboratory undertakes cutting edge scientific research to assess the impact of industrial and environmental chemicals on human health and ecosystem and also instituting programs for early identification and prediction of health disorders due to exposure to chemicals. This data helps in arriving at sound decisions for regulation of chemicals and introduction of safe products."

Technologies available with ITRC

Water Analysis Kit: A portable analysis kit for carrying out chemical and bacteriological tests has been developed, to determine the quality of water from public health point of view. The kit permits physicochemical and bacteriological tests to ensure safety of drinking water. The kit has been patented and the know how transferred to Jain Scientific Glass Works, Ambala Cantt; Gopi & Gopi Scientific Agencies, Kakinada and Mathbin Scientifics, New Delhi.

Colour Detection Strip (CD-Strip): The colour detection strip is used for the detection of butter yellow, a fat soluble cheap dye used some times to colour mustard oil. It is simple, easy and very fast on the spot test. A drop of test oil is placed on a small piece of chemically coated strip and change in the colour of the spot is observed. The maximum detection limit of this test strip is 0.001percent (10 ppm). The device has been patented and the know how transferred to Nelofe, Lucknow for its commercialization.

Bact-O-Kill: An electronic device has also been developed for disinfections of water to make it potable.

Mobile Laboratory Van: A mobile water-testing laboratory has been developed for physicochemical and bacteriological assessment of potable water in villages and remote areas.

ITRC has made some significant contributions to the industry like exploring the mechanisms by which pesticides, heavy metals, monomers, plasticizers and other plastic additives, solvents, food colors and dye intermediates act and elicit deleterious effects on human health.

The centre has also developed a method for early diagnosis of manganese poisoning. A peripheral model for monitoring the neurological disorders caused by neurotoxic substances and test kits for the detection of toxic food adulterants have been designed.

The Drinking Water Mission, Ganga Action Plan, Technology Mission on Edible Oils and Pulses, Global Climatic Change Program and the All India co-ordinated programs on food colors, pesticides and metal exposure assessment are also some of the major programs in which the ITRC has played a key role.

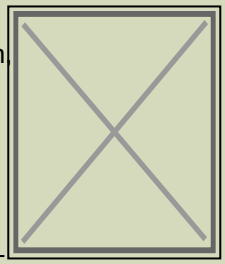
ITRC scientists have isolated microorganisms, which have the potential to degrade pesticides such as DDT, Endosulfan and lindane in the sites contaminated with them.

"The institute has undertaken some challenging assignment on testing of newer products reaching the markets including bio-engineered products. Ability of some chelating agents in neutralizing the toxicity due to metals and immunomodulators in case of solvents and monomers in animal models have been demonstrated at the centre. Vitamin B complex supplementation has been found to diminish susceptibility to lead and cadmium intoxication" informed Seth.

The laboratory signed a MoU with National Institute of Criminology and Forensic Science (NICFS) to provide training in toxicology. Also ITRC has been assessed and accredited in accordance with the standards of ISO/IEC 17025 in the field of chemical testing by National Accreditation Board for testing and calibration Laboratories (NABL) of DST.

Faiz Askari

"Innovative idea needs to be motivated"



Sitting with the ITRC director is a treat for any curious person. Because Gupta loves to answer all the curious questions, however simple it may be, without any trace of irritation. Soft spoken, innovation driven, Dr YK Gupta shared with BioSpectrum the highlights of the institution. Excerpts:

Which are the major thrust areas at ITRC?

The institute has a multidisciplinary team in the field of molecular biology, biochemistry, pharmacology, pathology, chemistry, zoology, microbiology and environmental sciences. In addition to this, new infrastructure facilities include Toxicology Information Centre, Bioinformatics Centre and other high end IT applications. An independent Research Planning and Business Development (RPBD) section for better coordination and liaison with industries has also been established at the centre. A newly developed Animal Facility as per GLP standards is almost ready. This will include breeding facility for different species of rodents, both inbred and transgenic strains and all types of animal exposure facilities.

The major R&D programs of ITRC are organized in the following six areas: health risk assessment, preventive toxicology, predictive toxicology, environmental toxicology, inhalation toxicology and analytical toxicology. We are also emphasizing on toxicogenomics, genotoxicity assessment of different chemicals/pollutants and genetically modified foods.

What are the new projects in the ITRC pipeline?

Many technologies are in the pipeline. Some of them include:

Arsenic analyzer: Arsenic contamination of ground water which results in serious disorders including fatalities is a global problem and detection of arsenic in ppb (parts per billion) level is a tedious job. ITRC has developed a field deployable low cost kit which can detect arsenic up to 10 ppb in water. The technology has already been patented and transferred to a major player in the field of analytical instrumentation in India, ELICO Ltd, Hyderabad.

Lead and copper sensor: A sensitive reliable and cost effective voltametric technique for the simultaneous estimation of lead and copper in blood and natural water samples has been developed.

From the point of view of safeguarding the environment, what are the hurdles?

The biggest hindrance in safeguarding our environment is the lack of awareness about the science. Misconceptions about science are the main factors which are building a gap between society and the science. To bridge this gap, it is needed to have trust on innovative science and its applications. Catering to this need of the society, we are conducting health surveys. Spreading education and awareness about the usage of chemicals in industries is also one of our focus areas.

Where does India stand in toxicology research at the global level?

"All substances are poisons. There is none which is not a poison. The right dose differentiates a poison from a remedy" said Paracelsus (1493-1541). Accordingly the toxicological estimation of all the intruders should be done very carefully. Therefore, the importance to toxicology has been increasing day by day and our centre is a renowned institution in this field. It is well-recognized worldwide and it is evident from its significant achievements and the presence of an exciting work force in the institute. ITRC is the only lab of its kind in South East Asia. In this way we are heading towards meeting the new challenges in the era of genomics.

But, a country like India definitely needs to grow in this area. Today, the main concern ahead of us is to spread the knowledge and work on innovative ideas to make ourselves leaders at the global level.

What is the future of toxicology in an area like genetics?

There are different cytogenetic techniques in the field of genetic toxicology to evaluate the genotoxic potential of different chemicals. It is a fast growing field. From this, the DNA damage could be estimated resulting from life style, occupational and environmental exposure.

ITRC is oriented towards understanding the mechanism of toxicity at the molecular level. We are also working on the development of "biomarker" for assessment of human exposure to chemicals for predicting the consequences of low-level chemical exposure on health and environment and identify populations susceptible to chemicals. Molecular biology and biotechnology approaches are being used to monitor the toxic chemicals and for bioremediation of toxicants.

To commercialize any technology, what are the basic requirements and how is ITRC meeting them?

Commercialization of any technology is vital for its success. As soon as we develop a technology we publicize it through seminars and workshops about that particular product. The know-how is then transferred to a prospective manufacturer on