

Case Code C49

49. INDUSTRIAL TOXICOLOGY RESEARCH CENTRE (ITRC)

"Ours is an interesting business. The more the problems of pollution caused in the society, the more the potential of the business we are in. Indeed, we find it difficult to cope with the demand. We neither wish nor pray to the Almighty to increase our business, unlike most other organisations. We are facing major challenges due to changes in the environment we operate in today, and have to find out ways to cope with it, in a way that the basic nature of our organisation remains intact," said the Director of Industrial Toxicology Research Centre (ITRC) while welcoming the delegates to the 27th Annual function of the centre.

Brief History of the Centre

Rapid industrialization, modernization of agriculture and the socio-economic upliftment were the three main strategies adopted by India for development. One of the unavoidable consequences of rapid industrialization and agriculture was the introduction of a variety of chemicals into our lives. Workers engaged in industrial or agricultural operations are both directly and indirectly exposed to the health hazards of such chemicals. On diffusion into the environment, potentially toxic chemicals could pose threats to the general population, disturb ecological equilibrium and thereby pollute--the environment. Industrial Toxicology Research Centre was established by the Council of Scientific and Industrial Research (CSIR), Government of India on November 4, 1965 at Lucknow, to meet the needs of identification of the harmful effects of chemical pollutants and devise appropriate curative/preventive measures.

Over a period of 27 years of its existence, ITRC grew in all the areas of modern toxicology in terms of both multi-disciplinary expertise and resources. It had contributed significantly to national priority areas of agriculture, industry, drinking water etc. But in this era of liberalisation,

Increased environmental awareness and reduced government financial support, ITRC was finding itself operating in a changing environment.

Mission of the Centre

ITRC was set up with a definite mission by the Government of India, "to serve the needs of the nation in the area of chemical safety" and ever since its growth and development it has been guided by it.

Objectives

The main objectives of the centre, set out in its charter at the time of establishment were as given below:

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- To identify the health hazards which industrial and agricultural workers are exposed to in their work environment.
- To develop evaluation capabilities for potentially hazardous chemicals used in industry, agriculture and day-to-day life.
- To identify the mode of action of chemical pollutants and develop research capabilities in the relevant scientific disciplines.
- To develop expertise in remedial/preventive measures.
- To collect and disseminate information on hazardous chemicals

The thrust of the centre had, however, undergone change over the years to maintain congruence with the national priorities. ITRC was set up during the Third Five Year plan because the emphasis on agriculture and industry in the first two five year plans had increased the threat of industrial and agricultural toxicity. An addition to its aims and objectives was made to include spreading the environmental awareness and safety after the 1971/74 Stockholm Conference on Environmental Consciousness. During 1985, it was entrusted with the responsibility of 'Drinking Water Mission' initiated by the then Prime Minister late Mr. Rajiv Gandhi.

The super system of ITRC consisted of the CSIR (which was the controlling body), the union government, which provided significant component of the financial resources and the market.

ITRC's interaction with the government was at three fronts: as a resource provider, as an evaluator and as a customer.

Till recently almost the entire resources were provided by the Union government through CSIR. The amount was gradually reducing (discussed later). This was putting a lot of pressure on ITRC.

As far as government as a customer was concerned, even in the changed scenario, if projects of national importance were handed down to ITRC, they had to be carried out irrespective of their profitability. This resulted in a cutback in the peripheral, routine research activities.

Approval from CSIR was necessary for projects above a certain amount. CSIR also evaluated ITRC's performance against its objectives. It also decided on the areas to be phased out from research activities. Though the CSIR structure was supposed to be decentralized, a lot of interference by CSIR took place in ITRC's activities.

Activities of ITRC

ITRC had three units to carry out its activities.

- a) Main campus, M.G.Marg, Lucknow.
- b) Gheru campus, Gheru, Lucknow.
- c) Occupational Health centre, Kanpur.

Research was carried out in 28 specialized sections that were grouped under 5 broad areas (see Exhibit 1 for details)

Environmental analysis
Systemic toxicology
Preventive toxicology
Eco-toxicology
Pesticide toxicology

New vistas such as bio-technology, preventive toxicology, immunobiology, photobiology had emerged recently as special interest areas.

In the last 27 years valuable research had been done on the toxicology of priority chemicals such as heavy metals, industrial dusts and fibres, plastics and polymers, hydrocarbons, pesticides, detergents, dyes and foodstuffs. Amongst these pesticides, heavy metals and hydrocarbons had emerged as the thrust areas.

Apart from research in these areas ITRC had also undertaken health surveys in industries, various edible oils and other food stuffs, and studies in public health morcidity etc. ITRC was extensively involved in the National Drinking Water Mission and the Edible Oil Mission. Several collaborative studies and research with foreign laboratories and regulatory bodies like WHO, ILO etc. were also done. ITRC also provided consultancy services to industry on various aspects of predictive and preventive toxicology, management of occupational health hazards, design and fabrication of equipment and hazard assessment through mathematical modeling.

The activities of ITRC required continuous updation of one's knowledge in the field. ITRC acquired the latest equipment from all over the world to develop Toxicity Data Units (TDU) and Distributed Information Centre (DIC) on toxic chemicals. It had a well equipped library containing some 25000 bound volumes, books and monographs.

Strategies to Solve the Toxicological Problems of the Country

Looking at the daunting task of toxicological problems, ITRC developed a multi-pronged strategy to handle it. The key elements of the strategy were:

- a) Interacting with industry to get a feel of their problems in the area of toxicology and try to solve them.
- b) Independently finding out the problems of industrial and agricultural toxicology and undertaking research/ surveys in these areas to offer curative and preventive solutions.
- c) Interacting with the ministries of health and environment to identify the problems of national priority and work on them.
- d) Keeping updated with the state-of-the-art development in various areas of toxicological research.
- e) Deputing its scientists/personnel abroad for further research development and to keep them abreast with the international developments in their respective areas.
- f) Collaborating with CSIR and other laboratories in India and abroad to undertake joint research work and organize symposiums seminars and workshops so that proper information of latest developments can be brought to India.

Over the last 27 years ITRC had endeavored to develop expertise in almost all the areas of toxicology and become the leading research institution in this part of the world. It had developed

toxicology information base relevant for the Indian context. It had also develop expertise to undertake large scale research on a continuous basis (like Ganga project, toxicology in mines etc.) besides the skills of identification of problems and human risk assessment associated with various toxic mechanisms. It thus covered the entire range viz. diagnostic, curative and s preventive measures of industrial/agricultural and environmental toxicology.

Organization Structure

TRC was established under the aegis of CSIR and so it had a close interaction with CSIR all along. The Technology Advisory Board and the Research Council of the CSIR interacted with ITRC and the CSIR had its representatives in the ITRC' management committee. The departments were organised on functional lines. The organization followed zero based budgeting methods for better resource allocation and control. The evaluation of ITRC was even being now done on the amount of research carried out. Thus ITRC had to carry out research for which it has to generate the resources itself. Also, the review of budgets was shifting from utilization based (i.e., whether funds were being utilized in the right manner and for the right uses) to performance based (i.e. the actual progress of projects and assignments).

Since the focus of the institute was on making it the premier research institution in the area of toxicology, the scientists of ITRC were highly qualified and possess a diverse and rich experience. The scientists are working in the categories from A to G (see Exhibit 3 for details). Entry level qualification is M.Sc. (first class) and scientists are encouraged to go for sabbaticals and further studies. A promotion of scientists earlier was primarily on time scale. The number of research papers published was another key indicator of their academic standing and competence. Frequent foreign tours acted as incentives to the scientists

There had been some change in the system lately in that the basis of evaluation of performance of research scientists at ITRC has shifted from seniority and the `number of research papers published' only to increase in weight age given to their participation in revenue generation activities. Initially, the departments within ITRC were only cost centers and budgets were allocated every year, based on estimates presented by them. But now, each department was being monitored for revenue generated, along with the cost cutting measures undertaken. So, although cost centers had not been formally transformed into profit centers, but the informal shift was discernible.

Challenges Faced by ITRC

"As environmental issues assume increasing importance in India, there is a corresponding increase in the role played by ITRC, which means that the workload of ITRC is going to increase in the years to come", said a senior scientist. "For instance", he continued, " ITRC has emerged as one of the agencies, authorized to issue certain Eco-Friendly certificates for certain product categories headed for Western markets".

Since late eighties the government's policy towards research funding of national research laboratories was undergoing a change, with increasing emphasis on the research bodies attaining self-sufficiency in financing of their activities, in a phased manner. "With such budgetary squeeze and a large portion (85%) of their total budget going into recurring costs (wages, etc.), the expansion activity in ITRC had come to a virtual standstill", said the Director. At the recent conference at Bangalore, the year 2000 A.D. was decided as the tentative year for the various CSIR

laboratories to attain self-sufficiency with respect to funding.

The immediate impact of the resource crunch was a freeze on investment on infrastructure which had been the competitive edge of ITRC. For instance ITRC had always acquired latest equipment for its research and thus had been a pioneer in their field in India. This freeze, some scientists were of the view, might adversely affect ITRC's ability to carry out such purchases. Pressure to reduce expenditure had made ITRC wind up its Occupational Hazard Centre at Kanpur and bringing its operations to Lucknow, resulting in a saving of about Rs. 3 lakh annually.

Besides the reduction in financial, support central government had also issued a directive in 1992 to freeze new recruitments in research organizations. Even prior to this, ITRC's recruitment was limited only to backward class candidates for quite some time. "Thus," said a scientist, "5 years hence, ITRC would be a graying organization. This might result in a decrease in fresh viewpoints on account of ITRC not capturing young talent".

Apprehensions were being expressed that on account of the above two factors and aforementioned promotion policy ITRC would soon have an "Inverted Pyramid" in the organizational structure. On the one hand, lack of expansion meant no new posts being created; on the other, recruitment freeze resulted in a decrease in the number of people in the lower grades. Moreover, while there was a need for professional business skills in the constraints (inflation built into wages sanctioned by the government) had led to ITRC employing a large number of adhoc staff. This was resulting in a vacuum at the lower levels which. Combined with the imminent retirement of 40 % of scientists over the next organization, the decreasing staff strengths on account of budgetary ten years could result in a crisis situation.

Besides these challenges originating from the government side, there was a considerable increase in the number of private research laboratories in the same field. However, these private research laboratories served more as test centres only for smaller projects, as they lacked the requisite infrastructure. Since the demand for these services was expected to grow, the number of such laboratories was likely to increase.

Competition

For its revenue generating activities like Eco-friendly Certificates, Accident Preparedness Programme, ITRC has to submit tenders to the relevant organization. Here it faces competition from 200 odd consulting agencies. ITRC's competitive advantage lies in

- Credibility
- Government label
- Infrastructural base

Organizational Response

"As far as competition is concerned, ITRC does not consider the private operators to be any kind of threat because ITRC perceives that the private operators cannot match their superior infrastructure and expertise," said a senior scientist. "However, those emanating from the resource crunch are really serious ones to adjust. ITRC is making conscious efforts towards reducing their dependence on budgetary support by increasing the proportion of cash flows from industry. This

can be discerned from the fact that industry funding as a percentage of total funding had increased from 10% in 1975 to 18% in 1985 and to 37.5% in 1993. In the meanwhile, cost-cutting measures have been initiated. There is a freeze on capital expenditure as well as on imports of any kind. The accent is on indigenization and on extending the life of equipment through maintenance and repair," he concluded.

Initially ITRC was carrying out research activities almost entirely for various government departments like UGC, Department of Science and Technology and Department of Environment and 75 – 80 % of its research work came from these government departments. Due to budget squeeze, even these organizations were hard pressed for funds. Therefore ITRC had to look for greener pastures. The public sector had emerged as a market, but with the public sector also under pressure, ITRC may ultimately have to tap the private sector.

ITRC has sharpened its focus by consolidating its earlier 236 areas of operation to 5 broad thrust areas (see Exhibit 3). This has been done to have synergy as well as utilization of the resources more efficiently.

"ITRC, just like many other government organizations today, is undergoing a period of transformation forced by the changing policies of the government," said the Director. Its future could very well be decided by how well it adapts to the changing circumstances and what strategies it employs. ITRC, in this fast-changing scenario, needs to adopt a market-oriented approach in its activities, in order to ensure its continued existence and development. CSIR, in a commercially oriented move, has proposed setting up a "Knowledge-Based Marketing Group" as a resource mobilizer. This concept would entail pooling of resources of the various CSIR laboratories in order to form an information base which can be subsequently offered to the industry. One more problem that we are facing these days is in the internal management of the centre. Despite the Knowledge-Based Marketing Group and ITRC's shifting focus towards private industry, the major policies like recruitment, promotion policy, etc. are still dictated by the government. Hence, grounds of potential conflict between priorities of ITRC and those of the government exist. The successful resolution of this conflict could be a critical determinant of its future performance," he concluded.

Until recently, scientists were involved in basic research. The changing environment was demanding business skills from them, for which they are not trained. Even to the research itself, it demanded a shift from basic research to applied research. Applied research demands better focus, more result orientation, more discipline and is more complex. "We, the scientist community, look down upon commercial activities. But today a stage has come where a shift in strategy demands a scientist with a commercial orientation," commented a scientist.

"It is quite difficult for people to change to new circumstances because of the existing mindset. The speed at which ITRC can adapt itself to the changed circumstances is constrained by the speed at which the scientists can adapt themselves to the changed circumstances. Management is reconciled to the change taking at least a generation because of these internal and external cultural factors", said the Director. "In India, if a man happens to miss the bus, at least his right to walk on the road should not be snatched away", another scientist added.

"The top management (director) here is unlikely to lose sight of ITRC's basic objectives since CSIR evaluates him against these very objectives," said a senior scientist. "However, the result of what top management conveys through its actions to the rank and file of ITRC might lead to some

problems. For instance, the top management is trying so hard to change the orientation of the scientists that there exists the danger of over-succeeding, i.e. scientists start evaluating themselves not by the quality of their research but only by the revenue they generate" The top management, however, was quite confident that this would not happen for the following reasons:

- The selection system followed by ITRC is such that only persons with a genuine interest in research will get in.
- Scientists have been evaluated up to now on their research work and have got used to it. Old habits die hard.
- Value system in the scientific community which looks down upon commercial activity.
- Human curiosity.

Future Activities

Sharing the plans for future, the Director said, "Although the traditional thrust areas were defined by ITRC scientists, ITRC is looking for new markets for its services. Cosmetic toxicology could be one area of great potential to ITRC. With the changing social mores, use of cosmetics is growing in India and along with this, the concern for harmful effects of these cosmetics is also bound to increase, as in the West.

"Secondly, with the advent of bio-technology, the use of biotechnology in industrial processes is also going up. This holds promise for ITRC in the future. ITRC till now has been hawking its talent and skills. But the time may not be far away, when ITRC just like other CSIR labs such as CDRI, would be offering saleable products to the industry.

"Thirdly, the pressures on environmental resources demand a recycling of industrial waste and effluents. The effluents can be processed so as to either make them safe for disposal in the environment, or reuse them for other purposes, e.g. effluent water from chemical plants can be detoxified and used for irrigation purposes.

"These are some of the tentative thoughts in our mind for the future. We have to look hard at ourselves, analyse what all it will involve before we can decide the strategies."

EXHIBIT1

The 5 broad thrust areas in which R & D is being carried out are as follows:

1. **Environmental health research:**
Health surveys are carried out for the various industrial workers, and the effect of artificial synthetics in foodstuffs etc.
2. **Systemic toxicology:**
Presence of particulate pollutants in the occupational environment is a major industrial hazard in India. Studies to this effect are categorized under this thrust area. Industrial dust and fibers like silica, mica, kaolin, talc asbestos are particulate pollutants.
3. **Preventive toxicology:**
Studies are done to understand the toxicity of the various industrial chemicals.
4. **Eco-toxicology:**
It was developed as a multi-disciplinary science for assessment of impact of pollutants through multi-species of microcosm studies.
5. **Pesticide toxicology:**
A pesticide like DDT organophosphates is being carried out.
Basically a detailed study among workers exposed to the various pesticides like DDT organophosphates is being carried out.

EXHIBIT-2

DISTRIBUTION OF ACTIVITIES OF ITRC AT VARIOUS CENTRES

Main Campus

1. Experimental Toxicology Metals
 - Dye-Stuffs
 - Pesticides
 - Plastics
 - Solvents
 - Noxious Dust
2. Epidemiology—Sponsored Health Surveys
3. Environmental Monitoring—Sponsored Surveys
4. Information
5. Library
6. Documentation
7. Industrial Liaison
8. Public Relations
9. Maintenance Services
10. House Keeping Services
11. Planning Cell
12. Management

Cheeru Campus

1. Central Facility for Safety Evaluation of Chemicals
2. Animal Breeding Facility
3. Sophisticated Instrumentation Facility
4. Inhalation Toxicology
5. Eco-toxicology
6. Phyto-toxicology
7. Analytical Toxicology
8. Environmental Microbiology
9. Water Analysis Laboratory
10. Environmental Carcinogenesis
11. Toxic Waste Disposal
12. Toxicology Information Centre
13. Eco-systems

EXHIBIT-3
FUNCTIONAL CHART OF ITRC LUCKNOW

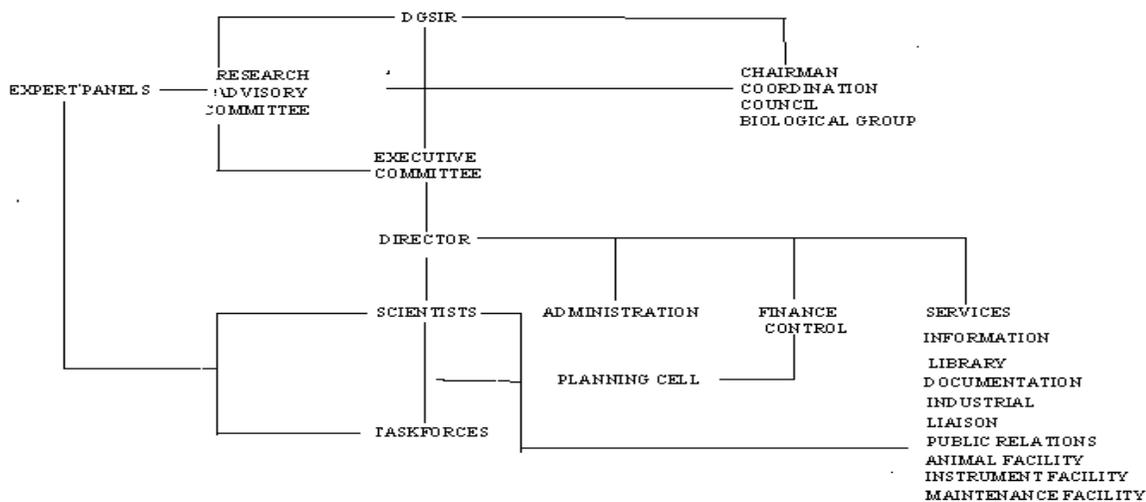


EXHIBIT-4
CORPORATIVE EVALUATION OF CSIR LABORATORIES FOR RESEARCH OUTPUT

Sl. No.	Name	Papers Indian	Pub. Per year Foreign	No. of Sc. B and Above in 1985	No. of papers Indian	Pub/Year/ Sc. Foreign
1	IRTC,Lucknow	27.3	27.3	76	0.36	0.36
2.	NPL, New Delhi	43	33.4	354	0.12	0.09
3.	CEERI	8.6	5.3	145	0.06	0.04
4.	CSIO,Chgh.	7	2	177	0.04	0.01
5.	NGRI,Hyd.	32	11.4	192	0.17	0.06
6.	NCL, Pune.	65.4	83.8	367	0.18	0.23
7.	CECRI,Karaikudi	48.2	13.8	188	0.26	0.07
8.	CSMCRI, Bhav.	27.0	7.5	107	0.25	0.07
9.	RRL,Hyd.	13.6	23.3	311	0.04	0.07
10.	RRL, Jorhat	30	21.2	145	0.21	0.15
11.	IIP,Dehradun	19.5	7.0	197	0.1	0.04
12.	CETRI,Mysore	55.6	27.2	289	0.19	0.09
13.	CDRI	37.7	64.0	227	0.17	0.28
14.	CLRI, Madras	22.	13	92	0.24	0.14
15.	IICB, Cal.	25.6	44.8	99	0.26	0.45
16.	NIO, Goa	88.6	6.6	205	0.43	0.03
17	NBRI< Lucknow	42.3	25.0	86	.49	0.29
18	RRL Jammu	47.6	22.4	131	0.36	0.17
19	CIMAP, Lucknow	20.2	16.2	85	0.24	0.36
20.	CCMB, Hyd.	5.6	10.4	55	0.1	0.19
21.	CFRI, Dhanbad	16.7	4.7	279	0.06	0.02
22.	CGCRI, Cal.	17.4	3.8	143	0.12	0.03
23.	NML, Jamshedpur	19.3	3.0	196	0.1	0.02
24.	CRRI, New Delhi.	19.0	0.8	94	0.2	0.01
25.	CBRI, Roorkee	47	5	167	0.28	0.03
26	CMRS, Dhanbad	11.8	1.4	152	0.08	0.01
27.	CMERIDurgapur	14.2	4.6	194	0.07	0.02
28.	NEERI,Nagpur	63.2	48.2	150	0.42	0.32
29.	NAL, Bangalore	14.0	19.0	234	0.06	0.08
30.	RRI,Bhub.	16.2	9.2	109	0.15	0.14
31.	SERC, Madras	11.0	10.5	74.	0.15	0.14
32.	SERC,Roorkee	9.5	4.75	27	0.35	0.18
33.	RRL, Trivendrum	31.3	3.6	47	0.67	0.08
34.	RRL,Bhoppal	9.6	8.4	16	0.6	0.53
35.	Nistads	22.8	6.6	47	0.49	0.14

Source: Nistads' Study (1986)