

Field Research Laboratory Leh, renamed as Defence Institute of High Altitude Research

DRDO's Leh-based Field Research Laboratory (FRL) has recently been renamed as Defence Institute of High Altitude Research (DIHAR).

With the passage of time, the vision, mission and mandate of the laboratory has changed; so the need for a change in the name to correspond with the ongoing research activities. Since its establishment, the laboratory has slowly transformed into a vibrant and world-class institution with its unique 'core competence' in 'cold, arid, agro-animal technologies'. The Institute is mainly focusing on vegetables, medicinal and aromatic plants, horticulture, afforestation, biotechnology, animal sciences and extension activities for high altitudes of Ladakh.

DIHAR is the only one of its kind, situated at an altitude of 3500 m amsl, having core competence in cold, arid, agro-animal technologies in the world. The new name will not only justify its ongoing R&D activities, but also give it a new identity both at the national and international level, according to Shashi Bala Singh, Director, DIHAR.

The proposal for the renaming of FRL came from W. Selvamurthy (Chief Con-

troller (R&D), Life Sciences and Human Resources) and the name was changed on 27 May 2008, after approval from M. Natarajan, the Scientific Advisor to the Defence Minister.

FRL established in 1962 at Leh-Ladakh was the brainchild of the first Prime Minister, Jawaharlal Nehru. The aim was to make the hostile terrain of the cold, arid desert of Ladakh reasonably green and make fresh food available to the troops deployed in the Ladakh sector. The Institute through its pioneering R&D efforts over the years, has brought about perceptible qualitative and quantitative changes in agriculture, animal husbandry and the flora of Ladakh.

To help realize the vision of achieving food security and self-sufficiency in fresh food items, not only to sustain the meagre local population but also the ever burgeoning troops deployed in Ladakh region, the Institute has now started working in different innovative areas of research and development. At present, the thrust has been directed to key areas like introduction and productivity enhancement of new vegetables, exploitation of high-altitude plant wealth for herbal

products, upgradation of local animal population with elite germplasm and use of post-harvest technology for increasing the shelf-life of perishable food items.

In view of the changing requirements of the region, the Institute is now venturing into newer areas like use of non-conventional sources of energy (mainly solar energy), low-cost quality seed production, zero energy storage of elite germplasm based on permafrost technology, bio-defence, contract farming, etc. DIHAR has been nominated as the nodal laboratory for all the high-altitude research activities of DRDO. Therefore, it will provide the necessary high-altitude logistics to support all the R&D activities of any DRDO laboratory in the high-altitudes of Ladakh. Ultimately it will help in meeting the focused regional requirements of not only the troops deployed in this sector, but also of the local population as well.

Gyan P. Mishra, Defence Institute of High Altitude Research, Leh, Ladakh 194 101, India.
e-mail: gyan.gene@gmail.com

MEETING REPORT

National agenda on problems and solutions*

A national conference was organized in honour of P. M. Bhargava, founder of the Centre for Cellular and Molecular Biology (CCMB) in Hyderabad, who completes 80 years this February. Around 150 science communicators, researchers, educationists and students from around India attended this conference.

Bhargava was felicitated by the Chief Guest U. R. Rao (former Chairman, Indian Space Research Organization). Lalji

Singh (CCMB), J. S. Yadav (Indian Institute of Chemical Technology (IICT), Hyderabad) and Mohit Bhargava were also present.

The two-day conference had four sessions in all. These included scientific temper, agriculture, new biology and society, and health. The session on scientific temper was chaired by A. P. Jayaraman and the speakers were Madhav Gadgil (Agharkar Research Institute, Pune), Jayant Narlikar (IUCCA, Pune) and V. B. Kamble (Vigyan Prasar, New Delhi).

Madhav Gadgil stressed on involving people; not just technical experts, but also barefoot environmentalists like autorickshaw drivers in monitoring and managing India's environment. Scientific

progress has been remarkable in simpler systems; however, it has been limited in the case of complex ecosystems. According to Gadgil, a study of local environment can be a good tool to help students imbibe scientific temper. He also suggested having a public database using Indian languages. Public assessment or 'parisara' regarding environment would provide a forum for all citizens, including experts to assess, point out possible lacunae and help incorporate improvements in order to promote scientific temper.

'Scientific temper is an essential component of man's mental framework in his struggles to face the challenges of the present and the future,' stressed Jayant Narlikar. There is a dire need for developing and practising scientific temper in

*A report of the National Conference on National Agenda on Problems and Solutions organized by the National Centre for Science Communicators and Vigyan Prasar, New Delhi, and held at Indian Institute of Chemical Technology, Hyderabad from 12 to 14 December 2008.

the current age of science and technology. Scientific outlook cannot be a prerogative of scientists; it has to be individual.

Narlikar recalling Jawaharlal Nehru's pre-independence expectation said that a free India will appreciate and develop scientific outlook, it dwells on the current situation, which marks a striking absence of it. He gave several examples amongst which he highlighted the superstitious mentality and people's belief in astrology. He described an experiment which demonstrated that astrology has no predictive power that is needed of a scientific theory. Instead of superstitions, traditional wisdom combined with the scientific temper can play a useful role in guiding the society towards a rewarding life in the present age.

Kamble talked about the numerous government and non-government organizations, which have been making concerted efforts to inculcate scientific temper and development of scientific outlook during the last few decades. According to him, drawing experiences, both personal and organizational, attempting to identify drawbacks and obstacles in the current efforts along with suggestions can help people think and act scientifically.

Jayaraman summed up the session's proceedings and suggested that an enquiry-based system needs to be included, which will help analyse thinking skills. According to him, thinking skills can be taught. Everyone has a right to information, especially students and thus another generation cannot be allowed to slip away from science.

The topic for the post-lunch session was agriculture. The session was chaired by Suman Sahai (former Chairman, Planning Commission's Task Force on Agro Biodiversity and Genetically Engineered Organisms). The speaker at the session was Y. L. Nene (Asian Agri-History Foundation (AAHF), Secunderabad) who briefed the audience about the classic literature on agriculture and its relevance to managing plantations.

India has a rich agricultural heritage since the time of the *Rigveda*. In the last decade, AAHF undertook the task of translating Sanskrit texts into English and publishing them. Nene stressed on the importance of this ancient knowledge available in the literature, and how it can be validated with modern tools and methods and incorporated into the present-day agricultural practices.

Amongst the classics listed by Nene included Krishi-Parasara (c. 400 BC), the first ever textbook on agriculture; *Kashyapiyakrishisukti* (c. AD 800), which describes farming as a noble profession; *Vrikshayurveda* of Surpala (c. AD 1000) that describes the application of the ayurvedic principle of 'doshas' to trees, and many others. The literature imparts guidelines and several technical recommendations concerning seed treatment, management of soil and water, animals and plant protection, and methods to increase yield.

Suman Sahai brought out the importance and relevance of these classics in today's set-up. Huge wealth of traditional knowledge serves as a backbone for the present technology. Talking about genetically modified (GM) foods, she mentioned that India lacks in regulatory procedures and the quality of testing is inadequate. A battery of tests is needed to analyse GM foods. Scientific studies in animals and mammals reveal a potential danger on human health causing collapse of the immune system, organ failure and high abortion rates in the future generations. Therefore, GM foods should not enter the Indian market at this point of time unless the safety of the product is ascertained.

The next day's morning session began with new biology and society, for which the chairperson was Hemu Adhikari (former scientist, BARC, Mumbai). The speakers included Lalji Singh and Aniruddha Malpani (Mumbai) and R. R. Bhonde (National Centre for Cell Science, Pune).

Lalji Singh, the pioneer of DNA fingerprinting, gave a lucid talk on the science of establishing individual identity: past, present and future. The dream of forensic scientists was fulfilled in 1985 by the discovery of DNA fingerprinting by Alec Jeffreys (University of Leicester, UK). The new strategy of genetic fingerprinting has diverse applications in forensic casework, monitoring cell-line identity, analysis of genetic diversity in a population, agriculture, wildlife conservation, in aquaculture, sericulture, population biology, identification of genes, pedigree analysis, maternity disputes and in cases of rape, murder and identification of mutilated or charred bodies.

Originally genetic fingerprinting strategies involved hybridization-based methods using multi-locus and single-locus probes. Subsequently, DNA-fingerprinting

strategies based on polymerase chain reaction using specific and arbitrary primers evolved. STR-based automation of DNA fingerprinting has drastically reduced the time needed for conducting the test, and has also increased the accuracy. STR gene is located on one of the 23 pairs of chromosomes present in the nuclei of cells.

Singh mentioned about the development of minisatellite DNA Bkm 2(8) probe developed from Indian banded krait (snake), which is used as a universal multi-locus probe for DNA fingerprinting in humans, animals and plants. The single-locus probes for humans are useful in cases of multiple rape and in creating a database of convicted criminals. The single-locus probe Bpf3.8 is human-specific and is therefore used in distinguishing human blood stains found at the scene of crime from that of animals.

The DNA chip/microarray technology allows the screening of genome at a scale. This has the potential for development of DNA chips for establishing the identity of an individual at the entire genome level. It will be the ultimate technique based on the comparison at the total genomic level.

Aniruddha Malpani, who has been working with infertile couples, talked about the latest reproductive technologies used to help such couples have babies. Using the new assisted reproductive technologies, there are now over 18 ways to make a baby. Malpani described the science behind *in vitro* fertilization, intra cytoplasmic sperm injection, pre-implantation genetic diagnosis and vitrification – frozen sperm, eggs and embryos. There are others, which include cloning, intravaginal culture and surrogacy. All these advances do raise a number of ethical concerns.

Stem cells and regenerative biology was discussed by Bhonde. Stem cells have a self-renewal capacity, plasticity, differentiation potential and regenerative ability. Depending on their origin they are classified as embryonic, foetal and postnatal/adult cells. Stem cells have great therapeutic potential in treating degenerative diseases. Bhonde described the aim of cell-based therapies as repair or replacement of damaged tissues and organs. Cells originating at foetal age are superior as a material for regenerative medicine purposes compared to their adult counterparts. These cells are isolated from the tissues normally discarded at

birth, thus avoiding ethical concerns. Bhonde summarized his research work on adult stem cells isolated from human bone marrow, umbilical cord, cord blood, placenta, amnion, adipose tissue, etc.

Hemu Adhikari spoke about the advances in biology and how they would benefit the society. He also mentioned about the ethical concerns regarding these latest techniques.

The last session on health was chaired by Kamala Krishnaswamy (former Director, National Institute of Nutrition). She spoke on diet-related chronic disorders. According to the WHO estimates, diet-related non-communicable diseases (NCDs) accounted for 59% of the 57 million persons who died in 2002. In India, all chronic diseases such as cardiovascular problems, diabetes, high blood pressure and cancer contribute to 53% of deaths and 44% of Disability Adjusted Life Years Lost.

According to Krishnaswamy, diet and lifestyle are important determinants of NCD. Complex carbohydrates (fibre), fats derived from plant sources, a combination of vegetable oils in proper proportions, vegetables and fruits with pulses are all good for health. Fat-free dairy products for calcium and protein, omega-3-rich foods such as fish, soy, and green leafy vegetables can be healthy choices. Low sodium and high potassium and calcium intake can help reduce blood pressure

and promote health. Active measures to promote physical activity both at individual and group levels – schools, industries, offices must be encouraged. Tobacco should be avoided. Krishnaswamy stressed on the fact that research should be prioritized to address the prevention and control of mortality and morbidity.

Mahtab Bamji (Dangoria Charitable Trust, Hyderabad) said that malnutrition is a curse for India. To combat malnutrition there has to be awareness and access at affordable price to not only a balanced diet, but also healthy environment, clean drinking water and healthcare outreach. The awareness has to be at all levels – policy makers, administrators, professionals and the community. Media can play a pivotal role in this regard, he mentioned.

In the dense forests of Hemalkasa, at the border of Maharashtra, Andhra Pradesh and Chhattisgarh, reside Madia and Gond tribes. They are neglected and deprived of basic necessities. They treat diseases with witchcraft and animal and human sacrifices. Anagha Amte, a gynaecologist by profession has been living with these tribes for the past 5 years. She and her family have been imparting medical health and making efforts to uplift their health under the Lok Biradari Prakalp, a project of the Maharogi Sewa Samiti started by late Baba Amte.

Amte shared her experiences while living with the tribes. She mentioned about nutritional deficiencies like vitamin B complex, iron, calcium, etc. inflicting them. Fatal diseases like cerebral malaria, tuberculosis, respiratory infections, cholera, snake and bear bites are common in the area. Burn injuries rise during winters, as many of them sleep around fire along with their children. Poor communication facilities hamper medical treatment. The project, said Amte, has made a difference. All diseases are being treated, deliveries conducted, vasectomies performed and health awareness has increased; yet, there is still a long way to go. The focus now is on project-run schools as children are the future torch bearers.

The last speaker on the last session was Sunil Pandya (Jaslok Hospital and Research Centre, Mumbai). Advances in science occur with breathtaking speed, impacting medical thinking and practice. According to Pandya, as long as these advances are tried out in laboratories and institutions using scientific and ethical principles, there is little cause for panic. The session was summarized by Krishnaswamy, and was open for discussion.

Parul R. Sheth (*S. Ramaseshan Fellow*), E-705/706 Kalp Nagri, Vaishali Nagar, Mulund (West), Mumbai 400 080, India. e-mail: parulrsheth@gmail.com