

## Radiation and quality of human life\*

In a seminar at the Press Club Knowledge Series Event, scientists from Bhabha Atomic Research Centre (BARC), Mumbai showcased the achievements made by their R&D (Life Sciences) Division. K. B. Sainis (Director, Bio-Medical, Group), A. K. Sharma (Head, Food Technology Division), S. G. Bhagwat (Head, Nuclear Agriculture & Biotechnology Division) and Gaurav Malhotra (Radiation Medicine Centre) addressed issues, including nuclear agriculture, food irradiation, nuclear medicine and health effects of radiation. M. G. R. Rajan (Head, Radiation Medicine Centre) graced the occasion.

There have been problems with availability of affordable and nutritionally adequate food in India. With challenges such as constraints of land and water, climate and threats from pests and plant diseases, it is important to combine nuclear techniques with agriculture and crop production. Bhagwat averred that if the country has to be self-reliant in food, it is imperative to embrace nuclear agriculture technology, especially when agricultural land is getting scarcer and demand for food is growing exponentially. India needs to boost its food production as well as ensure its safety and fair distribution to its increasing population. Not many will be aware that nuclear radiation-based technologies can significantly contribute to this effort. Bhagwat added that one of the major benefits of radiation effects on plants is enhancement of genetic variability which can be harnessed for developing new varieties of crops like cereals, pulses and oilseeds with desirable characters such as increased yield, disease resistance, early maturity, salinity or water stress tolerance, etc.

To date, 41 such varieties of different crops developed by the Nuclear Agriculture and Biotechnology Division, BARC, in collaboration with some of the Agri-

culture Universities in different states, have been gazette notified by the Ministry of Agriculture, Government of India for commercial cultivation by farmers in different states. These include 15 varieties of groundnut, three of mustard, two of soybean, one of sunflower, eight of mung bean (greengram), four of tur (pigeon pea), five of urad bean (black gram), one of chavali (cow pea), one of rice and one of jute. BARC has also developed several protocols for micro-propagation of elite varieties of banana. The other important research project is the breeder seed production that boasts of 1679 quintals (q) of groundnut production, 73 q black gram and 60 q of green gram in 2012. These achievements have been possible because of basic research inputs as well as strong linkages with Agriculture Universities and other major stakeholders.

Bhagwat also mentioned about intercropping – rice fallows in which after rice crop has been harvested, legume or pulse crop can be raised in the same soil that already contains enough moisture. Talking about pesticides and pest control in agriculture, he specifically mentioned about sterile insect technique in which insects are reared and sterilized using radiation. These insects do not have any progeny. BARC has been working with red palm weevil, a pest of coconut and date palm. Bhagwat clarified that BARC does not carry out research in the mobile telephony ‘microwave’ technology and confirmed that there is no conclusive evidence of any form of radiation causing cancer, including mobile telephony.

Sharma stated that the key to sustainability lies in ensuring proper preservation and safety of food. For this purpose, reduction in post-harvest losses is of utmost importance. Radiation processing of agricultural produce offers a major technology alternative to chemical fumigants for this purpose. Exposing foods to controlled doses of ionizing radiation can help sterilize, pasteurize and disinfect them. The process is irradiation of food that does not make it radioactive. According to Sharma, treatment with gamma radiation or electron beam enables disinfection of insect pests in stored pro-

ducts, delay in ripening of fresh fruit, inhibition of sprouting in tubers and bulbs like potatoes and onions, destruction of food-spoilage bacteria and elimination of parasites and pathogens in food. In addition, Sharma explained that disinfestation of quarantine pests in fresh produce provides a major boost to the international trade and promotes export. Considering that India is the world’s second largest producer of fruits and vegetables, the immense potential of radiation processing for export needs to be realized and well utilized. BARC has taken a lead in the development of irradiation protocols for several food products and has a unique R&D presence. Encouraging signs are increased public acceptance of food irradiation and interest of private entrepreneurs in setting up radiation processing plants.

BARC also offers nuclear medicine services at the Radiation Medicine Centre. Malhotra gave a detailed account of the use of radioactivity in the form of radiolabelled compounds (radiopharmaceuticals) for *in vivo* or *in vitro* diagnosis and treatment. The radiolabelled compounds are given in minute doses that ‘trace’ a particular physiological or pathological process in the body, thereby giving valuable information about the physiology, biochemistry or pathology of the body system, without causing any alteration of function. Amongst the many imaging techniques, single photon emission computed tomography (SPECT) with gamma-emitting radioactive atoms and positron emission tomography (PET) with beta-emitting radioactive isotopes are the most commonly used. Patients at BARC are given radionuclide therapies for thyroid cancer, thyrotoxicosis, neural crest tumours, neuroendocrine tumours and bone-pain palliation.

As a global average, Sainis mentioned that radiation dose from all natural sources is around 2.4 mSv/yr. He stressed the fact that radiation has played an important role in food, agriculture and health care. Talking about whether nuclear medicine has any ill-effects, he mentioned about the people living on the Kerala coast. The coastal belt of Karunagapally, Kerala, is known for high back-

\*A report on a half-day seminar on ‘Radiation and Quality of Human Life’ organized by Press Club, Public Relations Concept India (PRCI) and Bhabha Atomic Research Centre (BARC), Mumbai on 6 August 2013 at the Press Club, Mumbai.

ground radiation (HBR) from thorium-containing monazite sand. According to Sainis, people have been living in this area for centuries and generations. Several research studies have been carried out, including chromosomal studies, DNA damage studies and newborn deformities. No ill-effects have been found

until now. Out of the 144,000 newborns that were studied, 62% came from HBR areas and 30% from normal background areas. Yet there was no difference in the incidence of cancer, stillbirth or Down's syndrome. Even with continuous chronic radiation in these areas, no changes were detected at the molecular level. Accord-

ing to Sainis, the possible explanation could be adaptation.

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## R&D in Indian life sciences sector gets incentives from UK

To give a boost to Indian companies for effective translation and commercialization of life sciences projects, the UK Trade and Investment (UKTI) and the Life Science Investment Organization (LSIO) are promoting certain funding and tax incentive schemes. The UK offers a turnaround period of 54 days for non-CE marked (CE marking signifies that the product conforms to all European Community [EC] directives that apply to it) clinical trial approvals in the medical field. It helps countries like India build a body of evidence in support of CE marking in Europe, to ensure that it provides

medical technologies to patients 2–3 years ahead of the US and up to five years ahead of Japan. The schemes are relevant today for life sciences companies to commercialize medical innovation globally in the context of rising costs, risk and complexity of R&D. Adam M. Hill, Healthcare and Medical Technology Specialist, LSIO explained 'considering the fact that the global medical technology market is expected to double to approximately £300 billion by 2015, UK is establishing strong strategic relationships with high-growth markets like India. A culture of low cost, robust

innovation has made the life science industry in India a leading destination when searching for healthcare solutions'. Along with the government-backed schemes and incentives, the Medical Charities in the UK are actively investing in India. The Wellcome Trust, London (a global charitable foundation dedicated to achieving extraordinary improvements in human and animal health) continues to build upon its commitment to affordable healthcare.

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## Biocon successfully launches ALZUMAb for psoriasis patients in India

Nearly 10–20 million Indians suffer from psoriasis, an immune-mediated disease that affects the skin. Biocon has launched its first biologic drug ALZUMAb for psoriasis on 10 August 2013. This drug offers a new treatment option with a less aggressive dosing regimen and a longer treatment-free period, ensuring

better patient compliance and convenience. According to the announcement made by Kiran Mazumdar-Shaw, Chairman and Managing Director of Biocon, this is the world's first novel anti-CD6 (cluster of differentiation 6 is a human protein encoded by *CD6* gene) antibody to treat psoriasis. The drug has been devel-

oped using proteins, sugars and other living entities of the cell of living organisms and not by artificial chemicals. It took 10 years for Biocon to develop this drug. It will be sold in the market at about half the price of similar drugs manufactured by multinational companies.

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## Wild Life (Protection) Amendment Bill 2013

The Wild Life (Protection) Amendment Bill, 2013 was introduced by Jayanthi Natarajan, Minister of State for Environment and Forests, Government of India in the Rajya Sabha for strict enforcement of law to protect wildlife. The Bill provides the legal framework for the protection of various species of wild animals, management of their habitat and also for the regulation and control of

trade in the products derived from them. The Bill has the provisions for the Convention on International Trade in Endangered Species (CITES) of Wild Fauna and Flora. CITES is an international agreement that aims to ensure that international trade of wild animals and plants does not threaten their survival. The Bill also proposes stricter deterrents for crimes related to sale, purchase and

transfer of animals, their parts or products listed in various schedules. For more details see [http://164.100.47.5/newcommittee/press\\_release/bill/Committee%20on%20s%20and%20T.%20Env.%20and%20Forests/wildlife-E.pdf](http://164.100.47.5/newcommittee/press_release/bill/Committee%20on%20s%20and%20T.%20Env.%20and%20Forests/wildlife-E.pdf)

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