

# BRIT-DAE Annual Report 2016-2017

## Executive Summary

Board of Radiation & Isotope Technology (BRIT), the unit of DAE, is focussed on bringing the benefits of the use of radioisotope applications and radiation technology across industry, healthcare, research and agricultural sectors of the society. Harnessing the spin-offs from the mainstream programmes of DAE, such as R&D programmes at BARC and Nuclear Power plants for generating electricity by NPCIL, BRIT has independently created a separate visible area of contribution to the society.

## A. Products

### I. Healthcare Products

#### (a) Radiopharmaceuticals Production (RphP), Vashi

- 700 Ci of I-131 products in ~22500 consignments have been supplied to various hospitals in the form of capsules and solution for both, diagnostic and therapeutic purposes for thyroid disorders and treating thyroid cancer.
- 50Ci of other therapeutic products such as  $^{153}\text{Sm}$ ,  $^{177}\text{Lu}$  and  $^{32}\text{P}$  for bone pain palliation were supplied to nuclear medicine hospitals upto December 2016. New ready-to-use radiopharmaceutical product,  $^{177}\text{Lu}$ -DOTATATE injection developed, successfully tested at RMC, BARC on patients. RPC clearance is awaited for the product to launch it in market.
- 1282 consignments containing 455 Ci of  $^{99}\text{Mo}$  for Technetium-99m Generators to obtain  $^{99\text{m}}\text{Tc}$  at hospital end, have been supplied to various hospitals in India upto December 2016.
- More than 13829 consignments of Technetium-99m cold kits for imaging various organs have been supplied to nuclear medicine centres in India. Recertification and accreditation for 'cGMP-Pharma Products' by United Registrar of Systems was Completed for the production of ' $^{99\text{m}}\text{Tc}$ -Radiopharmaceutical cold Kits' during the reported period. New product,  $^{99\text{m}}\text{Tc}$ -cold kit developed by BRIT for preparation of  $^{99\text{m}}\text{Tc}$ -Macro Aggregated Albumin (MAA) injection, useful for lung perfusion imaging has been approved by Radiopharmaceutical Committee (RPC), DAE. Radiopharmaceutical Committee (RPC) approval is also obtained for extension of shelf-life (expiry date) of Technetium-99m cold kits, DTPA, Phytate & MIBI injections, from existing 6 months to one year and extension of expiry date for  $^{99\text{m}}\text{Tc}$ -Sulphur Colloid cold kit from existing 100 days to six months.
- New in-cell roof hanging and remote operated, decapping tool, for use of radioactive liquid vials, developed and installed in production plants.

#### (b) Quality Control Analysis & Quality Assurance of Radiopharmaceuticals (Allied Services to RPhP):

- Around 353 radiopharmaceutical samples and 36  $^{99}\text{Mo}$ - $^{99\text{m}}\text{Tc}$  COLTECH Generators were routinely analysed and certified by QC during this period upto December 2016.
- RPC approval obtained for the following quality control procedures: (a) Alternate BET method for TCK cold kits analyses; (b) QC methods for new products to be launched by BRIT, such as,  $^{177}\text{Lu}$ -DOTATATE;  $^{99\text{m}}\text{Tc}$ -MAA cold kits and  $^{99\text{m}}\text{Tc}$ -UBI.
- GMP compliance achieved for batch manufacturing records of 12 TCK products.

### **(c) Labelled Compounds (LC)**

- Labelled compounds Programme of BRIT continued the synthesis and supply of a variety of  $^{14}\text{C}$ ,  $^3\text{H}$  and  $^{35}\text{S}$ -labelled products and various types of Tritium-filled self luminous sources (TFS). Since April 2016, more than 26000 TFS sources of various sizes and shapes were supplied to defence establishments.
- Based on MoU between BRIT and Heavy Water Board, deuterated NMR solvents were dispensed and supplied to various customers.

### **(d) Medical Cyclotron Facility (MCF)**

- The Medical Cyclotron Facility (MCF) of BRIT continued the synthesis and supply of Positron Emitting Tomography (PET) radiotracers, the maximum being [F-18]-FDG. Other PET radiopharmaceuticals include [F-18]-NaF, [18F]-FLT, [18F]-FMISO and [F-18]-FET, which are produced in smaller scales.
- [F-18]-Fluro Ethyl -L- Tyrosine ([18F]-FET) was cleared by Radiopharmaceutical Committee (RPC) for regular supply. This will be used for biopsy guidance and treatment planning of cerebral gliomas.
- So far 263 Ci of F-18 FDG have been supplied to various hospitals in Mumbai for PET imaging upto December 2016.

## **II. Engineering Products**

### **(a) Sealed Radiation Sources**

- Nine teletherapy sources (CTS) of  $^{60}\text{Co}$  containing activity in the range of 164 and 226 RMM were supplied to different cancer hospitals in India and abroad upto December 2015.
- 69 Nos. of sealed sources containing Cs-137 with a total activity of 16474 Ci were loaded into 6 units of Blood Irradiator 2000.
- Eighty eight Irradiator sources of industrial grade in eight consignments with total activity of 14, 38, 169 Ci (1438 kCi) were supplied to nearly eight radiation processing plants within the country. Another 675 kCi of activity is planned to be sent to three processing plants within India and one to Sri Lanka.
- A total of 749 numbers (with total activity of 33, 987 Ci) of  $^{192}\text{Ir}$  & nine numbers of  $^{60}\text{Co}$  Radiography sources containing 255 Ci of activity were supplied to NDT users. Another 400 sources with activity 16000 Ci of  $^{192}\text{Ir}$  and five numbers with activity of 150 Ci of  $^{60}\text{Co}$  is expected to be supplied upto March 2017.
- One consignment each of Sc-46 and Cs-137 custom made reference sources (CMR) of 6.9 Ci and 970 mCi respectively were also supplied upto December 2016. Another fifteen Cs-137 CMR sources with 6500 mCi is planned to be supplied upto March 2017. Three numbers of Co-60 CMR with total activity of 427mCi were supplied upto December 2016 while another five sources with 500mCi is planned to be supplied upto March 2017.
- Licence for operation of Integrated Facility for Radiation Technology (IFRT) obtained from AERB and for the first time sealed sources were fabricated and handled at IFRT, Vashi.

## **(b) Radiation Equipments**

- 100 Radiography Cameras, ROLI-2 model were supplied to various NDT users within India and services were provided for 658 numbers of BRIT and imported radiography cameras.
- Two Blood Irradiators – 2000 (BI-2000) units with Cs-137 source were supplied to hospitals in India.
- One Gamma Chamber – 5000 unit have been supplied to Crop Research Unit, Research Directorate Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, Kolkata for research purposes.

## **B. Services**

### **I. Consultancy and MoU for Radiation Processing Plant**

- BRIT signed four MoU's for setting up Gamma Radiation Processing Plants for disinfestations, shelf-life extension of food products and sterilization applications of healthcare products, each with M/s Suzaina Foods Pvt. Ltd. at Kundh, Chikli District, Navsari, Gujarat, M/s KGS Agrotech Pvt. Ltd. at Saiwad, Jaipur, Rajasthan, M/s. Gaur Chemtech, Rohini, Delhi and M/s. Pinnacle Therapeutics Pvt. Ltd., Vadodra, Gujarat.

### **II. Gamma Radiation Processing Services (GRPS)**

#### **(a) Radiation Sterilization Plant for Medical Products (ISOMED)**

- 5860 Cubic meters of medical supplies have been sterilized using gamma radiation processing at ISOMED, BRIT upto December 2016.

#### **(b) Radiation Processing Plant (RPP), Vashi**

- About 3985 MT of spices and other products like herbal raw material, pet feed, color powder etc. were processed during the reported time period.
- NABL accreditation for calibration of dosimetry laboratory of RPP, Vashi was continued after the initial surveillance audit during this period.
- Dose rate certification was provided to eight blood irradiators and four gamma chambers which were supplied to various cancer hospitals and research universities respectively.

### **III. Radiation Physics Services**

- Source loading pattern was designed for replenishment of Co-60 activity for various Gamma Radiation Processing Irradiators provided by BRIT under MoU's.
- Carried out a study for using Cs-137 as source in Panoramic Gamma Irradiators for processing food commodities.
- Radiological Surveillance was provided to various facilities of BRIT such as, Radiation Processing Plant (RPP), Decayed Source Removal Facility (DSRF) and Integrated Facility for Radiation Technology (IFRT). Regular inspection for safety systems, contamination checks & personnel monitoring are done followed by sending the Safety Status Reports to AERB by the Radiation Physics Group.

#### IV. Calibration Services for Portable Radiation Monitoring Instruments

- BRIT is providing calibration services for gamma radiation survey instruments. So far 280 Numbers of Portable Radiation Monitoring Instruments have been calibrated.

#### V. Isotope Application Services (IAS)

- Isotope Application Services was provided for Fly ash disposal studies for Bhushan steel Ltd., Odisha, Gamma scanning of Process columns and Identification of leaky heat exchanger in a Series using radiotracer techniques to trouble shoot different kinds of problems at various industries such as BPCL, HPCL, IOCL etc. thereby saving crores of rupees for the country.
- Shield integrity confirmation using radiometry technique was also provided for AREVA, U.S., a project by Larson & Toubro. Radiometry studies of shielding casks of BLC-125 flasks for IS, SS&L, BRIT and exposure device for calibration of portable radiation equipments was undertaken during the reported period.
- A new method has been developed to extract Mo-99 was in the organic phase (20% D2EHPA in kerosene), which can be dissolved in diesel to carry out leak detection studies in diesel carrying components of crude oil refineries. Extraction of <sup>99</sup>Mo in aqueous solution was carried out with more than 80% recovery in organic phase. This procedure was developed first time by RPL in collaboration with IAS group and helped in faster service to the industries, removing the dependency on BARC for organic radiotracer supply.

#### VI. Radioanalytical Laboratory (RAL) Services:

- Radioanalytical Laboratory carried out more than 3200 tests on export/domestic commodities for gross alpha, gross beta, <sup>226</sup>Ra, <sup>228</sup>Ra and total uranium content and 940 tests on water samples.
- NABL accreditation was received for the Radio Analytical Laboratory (RAL), Vashi during the reported time.
- Radioanalytical Laboratory has started surveying and certifying surface radiation dose of steel consignments at factory premises and warehouses. Total of three steel surveys were conducted for certification of surface radiation dose.

#### C. Customer Support:

- Introduced online payment facility at BRIT website, [www.britatom.gov.in](http://www.britatom.gov.in), through State Bank of India's payment portal "State Bank Collect".