



BRIT-DAE Annual Report 2017-2018

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

- More than 700 Ci of I-131 products in ~22563 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. This also includes I-131 radiolabelled mIBG for diagnosis and therapy of Neuro Endocrine Tumors (NET).
- **New therapeutic product based on I-131 radiolabelling, ¹³¹I-Lipoidal injection for the treatment of Liver Cancer, was launched by BRIT in collaboration with RPhD, BARC.**
- 26.5Ci in 256 consignments of therapeutic products, other than I-131 based radioactive products, such as ¹⁵³Sm, ¹⁷⁷Lu and ³²P for bone pain palliation were supplied to nuclear medicine hospitals upto December 2017.
- **Regular production and supply of new therapeutic radiopharmaceutical, ¹⁷⁷Lu-DOTA-TATE injection for the treatment of sstr positive neuroendocrine tumors, has been started for treating NET successfully, after its RPC clearance.**
- **Production and supply of Kit for the preparation of therapeutic ¹⁸⁸Re-HEDP injection, another alternative product for bone pain palliation, is expected by March 2018.**
- 1800 consignments containing approximately 450Ci of ^{99m}Mo in the form of Sodium Molybdate solution for Coltech Generators, Geltech Generators and Solvent Extraction Generator for obtaining Technetium-99m at hospital end, have been supplied to various hospitals in India upto December 2017.
- More than 14800 consignments of Technetium-99m cold kits (19 Products; BRIT Code: TCK) for imaging various organs have been supplied to nuclear medicine centres in India. Production and regular supply of new product, ^{99m}Tc-cold kit for the preparation of ^{99m}Tc-Macro Aggregated Albumin (MAA) injection, useful for lung perfusion imaging, has been started. **Production and**

regular supply of another new product, ^{99m}Tc -Ubiquidine (Tc-UBI), used for infection imaging, is also started during the reported time.

- Radiopharmaceutical Committee (RPC) approval is also obtained for extension of shelf-life (expiry date) of Technetium-99m cold kits, namely, DTPA and Phytate injections, from existing one year to two years.
- Production of Kit for the preparation of ^{99m}Tc -HYNIC-TATE injection, useful for imaging neuroendocrine tumors, started as a part of technology transfer from RPhD, BARC.
- A total of 2200 Radioimmunoassay (RIA) and Immunoradiometric Assay (IRMA) kits are produced and supplied to various pathology laboratories and nuclear medicine centres throughout the country for *in-vitro* diagnosis of thyroid disorders.

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

- Around 437 batches of radiopharmaceutical samples and 36 ^{99}Mo - ^{99m}Tc COLTECH Generators were routinely analysed and certified by QC during this period upto December 2017.
- Validation for in-house Bacterial Endotoxin Test (BET) of TCK products (Cold kits) was successfully completed. The method is implemented in regular Quality Control tests of TCK kits. HPLC method for the analysis of ^{99m}Tc -MIBI is standardized and would be put up for RPC approval. Animal use for the analysis will be stopped, once it is approved by RPC.
- Batch Manufacturing Production Records (BMPR) for TCK cold kits (19 Products) were modified and improvised as per GMP guidelines.

(c) Labelled Compounds (LC)

- This Section of BRIT continued the synthesis and supply of a variety of ^{14}C , ^3H and ^{35}S -labelled products and various types of Tritium-filled self luminous sources (TFS). It is also involved in the production and supply of C-14 Urea Capsules. The 'Urea Breath Test' using these capsules is useful in the diagnosis of the infections caused by microorganisms named, Helicobacter pylori, a spiral bacterium, which may be responsible for gastritis, gastric ulcer, and peptic ulcer disease.
- Since April 2017 and upto December 2017, more than 16000 TFS sources of various sizes, shapes and tritium content were supplied to defence establishments and used for illumination of various types of gadgets and instruments.
- Based on MoU between BRIT and Heavy Water Board, deuterated NMR solvents were dispensed and supplied to various customers. All the solvents supplied had >99.8% Deuterium abundance.

(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, and newly launched [F-18]-FET, which are produced in smaller scales.

- So far 253 Ci of [F-18] FDG in 563 consignments have been supplied to various hospitals in Mumbai for PET imaging upto December 2017. More than 15000 patients are benefitted with PET investigations in the reported year 2017-18.

II. Engineering Products

(a) Sealed Radiation Sources

- Nineteen teletherapy sources (CTS) of ^{60}Co containing activity in the range of 154 and 232 RMM were supplied to different cancer hospitals in India and abroad upto December 2017.
- Co-60 with activities of 808 Ci in eleven pencils and 83,711 Ci in 128 pencils were loaded in one unit of Blood Irradiator (based on Co-60 BI 2000) and six units of Gamma Chamber 5000 respectively. Cs-137 is planned to be loaded in Blood Irradiator 2000, the availability of which is being awaited from WMD, BARC. Also, loading of Co-60 source in two units of Gamma Chamber 5000 is planned upto March 2018.
- Sixty six Irradiator sources of industrial grade in eight consignments with total activity of 11, 01, 002 Ci (1101 kCi) were supplied to nearly eight radiation processing plants within the country and abroad. Another 650 kCi of activity is planned to be sent to four processing plants within India upto March 2018.
- **Co-60 teletherapy source of 180 RMM was exported to Kenyatta National Hospital, Kenya. One Co-60 Irradiator source of 125 RMM was exported to Srilanka Atomic Energy Board for source replenishment in Multipurpose Gamma Irradiator at Biyagama.**
- A total of 595 consignments (with total activity of 26,845 Ci) of ^{192}Ir & twelve numbers of ^{60}Co Radiography sources containing 662 Ci of activity were supplied to NDT users. Another 200 sources of ^{192}Ir with 9500 Ci activity and two numbers of ^{60}Co sources with 100 Ci activity is expected to be supplied upto March 2018.
- Thirteen consignments of Co-60 Custom Made Reference (CMR) sources with total activity of 739 mCi were supplied and another 4 sources with 250 mCi is planned to be supplied upto March 2018 to its users.
- Integrated Facility for Radiation Technology (IFRT) continued the fabrication & loading of radioactivity (sealed sources) in Gamma Chambers and Blood Irradiators which are supplied from Vashi Complex

(b) Radiation Equipments

- 43 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.
- Five Blood Irradiators – 2000 (BI-2000) units with Cs-137 source were supplied to hospitals in India in the reported time period.
- Four Gamma Chamber – 5000 units have been supplied to various Universities/Institutions for research purposes upto December 2017.

B. Services Provided by BRIT

I. Consultancy and MoU for Radiation Processing Plant

- BRIT signed two MoU's for setting up Gamma Radiation Processing Plants for disinfestations, shelf-life extension of food products and sterilization applications of healthcare products. One with M/s Jamnadas Industries, Dahod, Gujarat, to set up Gamma Radiation Processing Plant at Indore, Madhya Pradesh and the other MoU was signed with M/s. Andhra Pradesh Med Tech Zone Ltd., Vishakhapatnam, Andhra Pradesh.

II. Gamma Radiation Processing Services (GRPS)

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

- 3872 Cubic meters of medical supplies have been sterilized using gamma radiation processing at ISOMED, BRIT upto December 2017.

(b) Radiation Processing Plant (RPP), Vashi

- About 3654 MT of spices and allied products were processed during the reported time period. It is expected to process nearly 5000 MT of various products upto March 2018.
- **Surveillance Audits for ISO – 22000:2005 (Food Safety Management Systems) and ISO 9001:2008 were carried out by certifying agency and found the Radiation Processing Plant at Vashi, in full compliance with Standard's requirement.**
- Dose rate certification was provided to two blood irradiators and three gamma chambers which were supplied to various cancer hospitals and research universities respectively.
- Production & supply of ~1.5 Lakhs Ceric-Cerous Sulphate Dosimeters were done for various gamma irradiators in the country and abroad for the measurement of absorbed dose.
- **NABL accreditation was renewed for the Calibration Dosimetry Laboratory till 2019.**

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. A total of 500 survey meters, dosimeters and portable area monitors are calibrated upto December 2017. Around 25 instruments are likely to be calibrated till March 2018 end.

V. Isotope Application Services (IAS)

- Isotope Application Services was provided for Gamma Column Scanning for seven different petroleum industries. Gamma scanning of Process columns and Identification of leaky heat exchangers using radiotracer techniques to trouble shoot different kinds of problems at various industries such as HPCL, both, Mumbai and Vishakhapatnam, IOCL, Mathura, BOREL etc. thereby saving crores of rupees for the country.
- Radiometry tests for efficiency of Spent Fuel Canisters and Discs for Larson & Tubro Ltd. Ranauli, near Vadodra, Gujarat was tested. More than 50 such radiometry tests have been carried out during 2017-18.

VI. Radioanalytical Laboratory (RAL) Services:

- Radioanalytical Laboratory carried out more than 3200 tests on export/domestic commodities for gross alpha, gross beta, ^{226}Ra , ^{228}Ra and total uranium content and 940 tests on water samples. RAL has carried out around 3000 tests on export/domestic commodities and 700 tests on water samples (gross alpha, beta ^{228}Ra & ^{226}Ra)
- Radioanalytical Laboratory has started surveying and certifying surface radiation dose of steel consignments at factory premises and warehouses.

C. Customer Support:

- As the nodal agency for sales and supply, marketing and customer relations, co-ordination & logistics support cell continued to provide regular and uninterrupted supply of radioisotopes & allied products, radiation technology equipments to about 2000 user institutions in the healthcare, industrial, research and agricultural sectors.