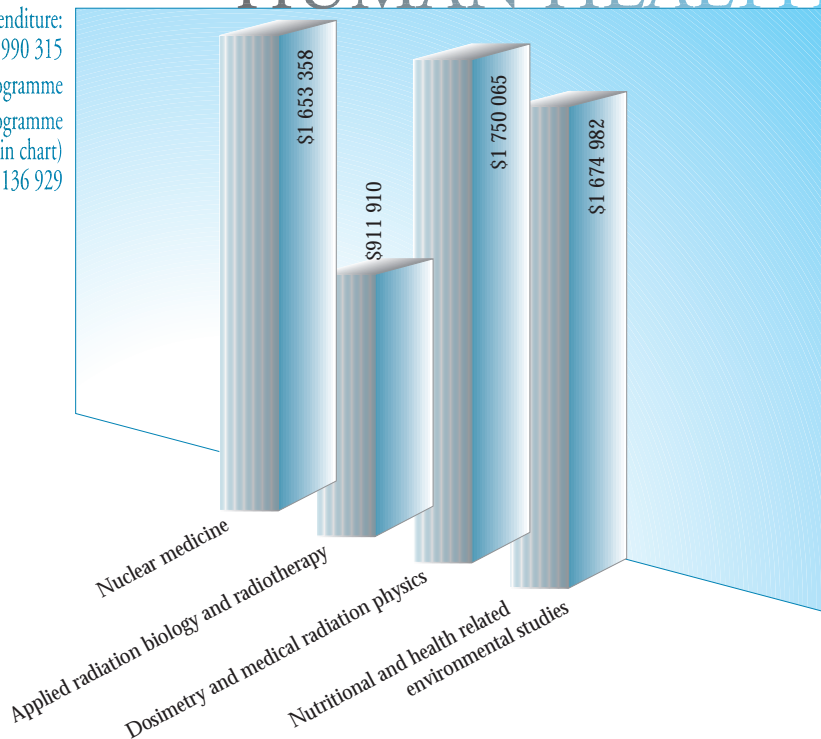


HUMAN HEALTH

Regular budget expenditure:
\$5 990 315
Expenditure by subprogramme
Extrabudgetary programme
expenditure (not included in chart)
\$136 929



The Agency's programme in human health concentrated on the development and application of new nuclear related methods and treatments. In nuclear medicine, molecular biology employing radioactive isotopes was used for the diagnosis of infectious diseases. In radiation therapy, there were renewed efforts to improve the quality control of cancer treatment. The thermoluminescent dosimetry (TLD) measurement system of the IAEA/WHO worldwide network for beam quality checks in radiation therapy was automated at the Agency's Laboratories at Seibersdorf. In the field of nutrition, agreement was reached with WHO on a CRP on infant monitoring to define a new growth reference for breastfed babies.

number of CRPs, training programmes and technical co-operation projects, these new techniques have contributed significantly to the understanding of the pathogenesis and management of several diseases. Thus, hepatitis C subtypes have been identified that are more resistant to treatment than other subtypes, while some hepatitis B subtypes have been shown to have a poor prognosis. For diseases such as tuberculosis and malaria, it has been possible to identify drug resistant strains of the infectious agents (bacillae or parasites). Another application of the new technology has been in the timely diagnosis of genetic disorders, resulting in better counselling of the affected population. The results obtained from a CRP on Chagas disease have helped the Agency to improve a more sensitive and specific molecular technique suitable for screening blood in blood banks.

Nuclear medicine

Radionuclide based molecular techniques (based on the detection of nucleic acids using the 'polymerase chain amplification technique') were developed for the diagnosis of a wide spectrum of infections (tuberculosis, hepatitis, leishmaniasis, Chagas disease) and genetic disorders (Thalassemia, fragile x syndrome). Applied in developing Member States through a

The development of low cost, robust radioimmunoassay (RIA) bulk reagent technology in developing Member States has resulted in a wider application of this technology. Important examples are the cost effective screenings of millions of newborn children for congenital hypothyroidism, detecting hepatitis B carriers and monitoring tumour markers in cancer patients. One of the major tasks has been to re-examine the current prevalence of hepatitis B carriers in 11

countries of the Asia-Pacific region using common immunoradiometric assay bulk reagents. The rates of prevalence ranged from 0.2 to 18% in blood donors and 0.4 to 10.6% in pregnant women.

The Agency concluded a randomized clinical trial comparing the efficacy and toxicity of strontium-89 and phosphorus-32 in the palliative treatment of metastatic bone pain. The results of this trial have revealed that phosphorus-32, which is inexpensive and easily available in many developing Member States, is as effective as the far more expensive strontium-89, with no significant difference in the levels of tissue toxicity.

More than 50 gamma cameras were upgraded with the Agency's personal computer based nuclear medicine computer systems in Africa, Asia, Latin America, eastern Europe and west Asia. On the basis of two recently concluded CRPs, certification criteria for the external assessment of preventive maintenance and quality control of many nuclear medicine instruments were developed. After testing in Asia and Latin America, these criteria are now being recommended to national authorities for implementation.

As part of a thematic programme on health care, the Agency initiated a series of projects on the application of nuclear medicine technology in routine health care in the Asia-Pacific region. The subjects covered include myocardial perfusion scintigraphy, diagnosis of breast cancer, treatment of thyroid cancer with iodine-131 and the management of diabetic nephropathy.

The initial phase of an RCA project to improve the technical skills of nuclear medicine professionals through distant training programmes was completed. The training material, now available in English, will be translated into various languages and distributed to more than 3000 technicians working without any formal training at nuclear medicine departments in developing Member States.

Applied radiation biology and radiotherapy

A CRP was initiated to test different methods of increasing the effect of radiotherapy on tumours. The methods include the addition of heat to the tumour

area (hyperthermia) and giving the patient medication as a chemical sensitizer of radiation (AK-2123 or 2-deoxyglucose). The protocols developed for the chemical sensitizers were designed for use in developing countries.

An Advisory Group meeting was held on the requirements for a 'mould room' (i.e. a room to prepare patients) for teletherapy administration. The Group specified the equipment needed for mould rooms at different stages of advancement. It also identified the need for a manual covering mould room operation and recommended cost effective ways of immobilizing patients, altering the beam to accommodate the shape of patients and deriving patient data for planning. Many of the conclusions are being incorporated into technical co-operation programmes.

Dosimetry and medical radiation physics

The Secondary Standard Dosimetry Laboratory (SSDL) network presently includes 70 laboratories and 6 SSDL national organizations in 58 Member States. The network also includes 19 affiliated members, mainly Primary Standard Dosimetry Laboratories (PSDLs), the International Commission for Radiation Units and Measurements (ICRU), the Bureau International des Poids et Mesures (BIPM), and other international organizations.

To establish a link to the international measurement system, the Dosimetry Laboratory, part of the Agency's Laboratories at Seibersdorf, calibrated reference ionization chambers and dosimeters from 38 Member States, including laboratories and hospitals. A total of 46 reference ionization chambers were calibrated at 175 calibration points for various radiation qualities.

A dose quality audit based on the calibration of field ionization chambers involving 22 SSDLs was organized to guarantee that the standards transmitted by SSDLs to users in Member States are within the required levels. A quality audit system based on mailed TLDs has been applied to 105 radiation beams produced by cobalt-60 therapy units and medical accelerators in order to verify their calibration by the SSDLs.

Procedures for the calibration of well type ionization chambers, to be used with radiation sources for

brachytherapy, were developed and the first calibration of a national laboratory instrument was carried out at the Dosimetry Laboratory.

A mammography diagnostic X ray unit was installed at the Agency's Laboratories, and radiation measurement standards for these X ray beams are being developed. A TLD based audit system for the dosimetry of low doses in caesium-137 gamma ray beams was also developed.

The IAEA/WHO TLD postal service evaluated 286 dosimeter sets irradiated by radiotherapy centres in developing countries to verify the calibration of clinical beams from cobalt-60 treatment units and medical accelerators. The Agency's TLD measurement system features a new automatic TLD reader and procedures to speed up the process of evaluating dosimeters. As a result of the automation, the likelihood of operator error has been reduced considerably and the number of TLD audits per year is expected to increase.

A CRP was initiated to develop national quality audit programmes for radiotherapy dosimetry in developing countries. In addition to transferring the Agency's methodology, it will provide regular TLD services to all radiotherapy hospitals in participating countries and TLD audits in six of the countries.

The second edition of an Agency report that provides the technical requirements for the calibration of radiation beams — *Absorbed Dose Determination in Photon and Electron Beams: An International Code of Practice* — was published. To take into account new standards for radiation measurements, preparation began of a Code of Practice based on a standard of absorbed dose to water.

intervention programmes. For example, a project in Peru used isotope techniques to monitor a school breakfast programme for more than two million children. Agreement was reached with WHO on a CRP on infant growth monitoring which, for the first time, is expected to define a growth reference for healthy breastfed babies in developing countries. Another agreement, with UNICEF, involves the use of isotope techniques to support that organization's multi-country field trials of the efficacy of iron and zinc supplementation to reduce anaemia and growth faltering in infants.

A new CRP was initiated on the use of plants (mainly lichens and mosses) as biomonitors of airborne pollution. Through the Agency's support, more than 30 developing countries are now in a position to monitor levels of airborne particulate matter in the size range below 2.5 μm , which is of the greatest relevance for human health. The data obtained will eventually be incorporated into a global database on airborne particulate matter maintained by WMO.

Efforts to determine the presence of radionuclides in the environment focused on the completion of a radiological study on terrestrial samples collected at Mururoa and Fangataufa Atolls in the South Pacific, where French nuclear weapon testing took place. Some additional measurements of samples were made and all of the data were compiled in the project's final report.

Nutritional and health related environmental studies

Nutritional deficiencies of energy, protein, vitamins and minerals continue to affect hundreds of millions of people, particularly — but not only — in the developing world. Agency programmes direct attention to the use of isotopic techniques — mainly with stable isotopes — to identify populations at risk, and to monitor and improve the effectiveness of dietary