Dose Assessment and Dose Registry

João Garcia Alves

The activity of the Dose Assessment and Dose Registry unit is directed towards the assessment of doses to the Portuguese population due to several types of exposure to external radiation.
The activity developed in 2007 was mainly directed to the improvement of the performance of the individual monitoring service in the fields of personal and environmental monitoring, the Central Dose Registry, dissemination of results, preparation of research projects, as well as in the participation in international projects. Since January 2007 care was also given to the EURADOS Council membership.
The main activities developed were focused on:

Assessment of the occupational radiation doses: In 2007 the Individual Monitoring Service of ITN provided whole body dosemeters to approx. 3,200 workers on a monthly basis. Two LiF (TLD-100 and TLD-100H) extremity dosemeters were tested and performance tests of the whole body dosemeter were also re-evaluated.

Improvements to the Central Dose Registry and analysis of the occupational exposure data: In 2007 the CDR increased the frequency of occupational data collection to a quarterly basis. Staff doses in cardiology and interventional radiology were analysed into more detail.

Assessment of the cosmic radiation dose received by military aircraft crew: The collaboration with the Centro de Medicina Aeronáutica da Força Aérea Portuguesa, for the estimation of cosmic radiation doses received by military aircraft crew in transport missions was continued. The assessment is based on simulation programs, such as CARI and EPCARD. The latter is used under licence agreement from the Institute of Radiation Protection of GSF-National Research Centre for Environment and Health (presently Helmholtz Zentrum Munchen, German Research Centre for Environmental Health).
Collaboration with other groups at DPRSN lead to the preparation of the project *Ionizing radiation and malignant melanoma: a clinical and biomolecular approach* (PIC/IC/82847/2007). The exposed group concerned are airline pilots and the cosmic dose data will be estimated using the above mentioned software programs. The project was submitted to Fundação para a Ciência e Tecnologia (FCT) for financial support and is presently under evaluation.

Assessment of the environmental gamma radiation dose to the Portuguese population: The ambient dose equivalent integrated in quarterly periods was measured in three sites at ITN *campus* and in a nine other locations in Portugal, as contribution to the National Radiological Monitoring Program.

Partnerships and training: Training on individual monitoring methodologies, dose registry, QA/QC and general routine work was mainly directed to R. Esmail (Mozambique, Ministry of Health).
A partnership in the field of dosimetry and radiological protection was established with Aux. Prof. A. Pascoal, Faculdade de Engenharia (FE) da Universidade Católica Portuguesa (UCP). The project *Mammography: impact of digital imaging technologies and optimization of its use in breast cancer screening and diagnosis* (PIC/IC/83018/2007) was prepared, submitted to FCT for financial support and is presently under evaluation. Three MSc students from FE-UCP collaborated in on-going activities and another student has started PhD work.

International collaboration: On-going collaboration in international working groups was developed in the framework of EURADOS activities, namely the participation in WG2 *Harmonization of Individual Monitoring in Europe* and more recently with the approval of the EC-funded **EU-Trimer** project.
In 2007 the Individual Monitoring Service raised approx. € 130.000,00. Three papers were published in scientific journals; four were accepted and are presently in press; an invited lecture was proffered at the SSD-15 Conference in Delft; a MSc thesis and specific contributions for two reports were prepared.

Research Team

Researchers

J.G. ALVES, Aux., Group Leader
M.B. MARTINS, Princ.

Students

M. PEREIRA, ITN grant (since September)
L. NOVAIS, FCT-EURATOM grant (until September)
L. FREIRE, MSc student
A. CALADO, PEPAP grant (until July)

Technical Personnel

M. MARTINS, laboratory technician
M. SARAIVA, administrative (since May)
S. RANGEL, consultancy contract

Collaborators

R. ESMAIL, trainee (Rep. Mozambique, Min. Health)
J. MAIROS, Medical Doctor (Centro de Medicina Aeronáutica)
A. PASCOAL, Aux. Prof. (FE-UCP)

EU-Trimer: European technical recommendations for individual monitoring of external radiation

J.G. Alves, P. Ambrosi[2], D.T. Bartlett[3], L. Currivan[4], J.W. van Dijk[5], E. Fantuzzi[6], V.Kamenopoulou[7]

Objectives

The aim of this project is to prepare the European technical recommendations for monitoring individuals exposed to external radiation.

It is a two year project funded by the European Commission, Directorate-General Energy and Transport under contract TREN/07/NUCL/S07.70121.

Results

The European Commission Directorate General Transport and Energy (EC-DGTREN) issued in September 2006 a call for a tender entitled "Establishment of European Technical Recommendations for Monitoring Individuals Exposed to External Radiation" (TREN/H4/98-2006).

A proposal was prepared by former subgroup 1 of Eurados WG2 on *Harmonization of Individual Monitoring in Europe* and a Consortium agreement was established between the Greek Atomic Energy Commission (GAEC) and EURADOS.

In February 2007 notice of the success of the proposal was received and the relevant contract between EC DGTREN and GAEC was signed in April 2007.

The project is named EU-Trimer, has a duration of 24 months and the main objective of EU-Trimer is to draft new European Technical Recommendations for Monitoring Individuals Occupationally Exposed to External Radiation, according to the most recent scientific and technical knowledge.

The organizational scheme of EU-Trimer includes the project task group comprised by colleagues from GAEC, HPA, NRG, PTB, RPII, ENEA and ITN for the preparation and writing of the new document, the previous Eurados WG2 working group members, as well as contact persons from an Extended Group of European Countries (EGEC).

The input from international and European organizations like the IAEA, IEC, ISO, ICRU, ICRP, ESOREX, EUROMET and EAN is ensured.

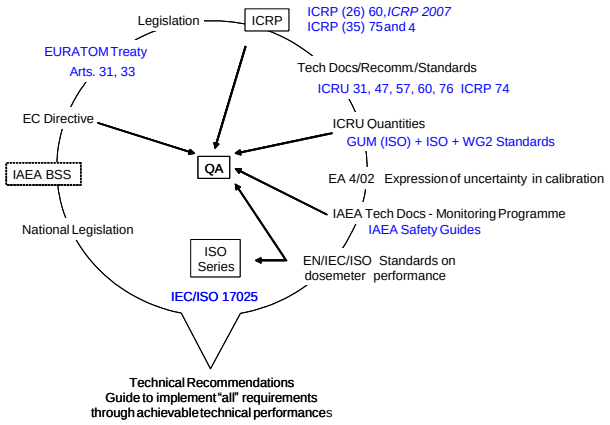
The network of contact persons in the EGEC was also considered crucial to the success of the project to provide inputs from relevant national organizations like radiation protection authorities, individual monitoring services, calibration laboratories from the EU member, candidate and associate States.

The last part of EU-Trimer will be the presentation of the new document to the Group of Experts established under Article 31 of the EURATOM Treaty and seek for approval.

At its present stage a first draft was prepared in December 2007 and sent to the EU-Trimer group of persons for comments and suggestions. Inputs are expected at the next Eurados Annual meeting to be held in January 2008.

Published work

E. Fantuzzi, J.G. Alves, P.A. Ambrosi, D.T. Bartlett, L. Currivan, J.W.E. Van Dijk and V. Kamenopoulou, Need for a new document to replace EUR 14852 "Technical recommendations for monitoring individuals occupationally exposed to external radiation, Editorial to Radiat. Prot. Dosim. (in press).



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Individual Monitoring Service: individual and environmental monitoring

A. Calado[1], L. Freire[2], L. Novais[3], M. Martins, M. Pereira[4], M. Saraiva, R. Esmail[5], S. Rangel, J.G. Alves

The Individual Monitoring Service at ITN is based on a TLD system, that consists of two 6600 Harshaw readers and on the Harshaw 8814 TL card and holder containing two LiF:Mg,Ti (TLD-100) detectors for the evaluation of $H_p(10)$ and $H_p(0.07)$. Nearly 3,200 workers are monitored on a monthly basis. Two LiF varieties of extremity dosemeters based on TLD-100 and on LiF:Mg,Cu,P (TLD-100H) were tested according to the ISO 12794:2000 and national requirements (DL 167/02), with the aim of establishing and implementing the extremity monitoring methodology and at the same time selecting an extremity dosemeter for workers in the field of Nuclear Medicine at ITN as well as for outside costumers. Performance tests of the whole body dosemeter were also re-evaluated.

In January 2007 the electronic backup of the dose reports issued every month was introduced. Since then, the individual reports internally issued to ITN workers is performed by e-mail to their personal accounts. Environmental monitoring was also performed at the service based on the same whole body dosemeter calibrated free in air in terms of $H^*(10)$. The aim of this work is to continuously perform quarterly measurements of the ambient dose equivalent due to external radiation at four sites at ITN *campus* and nine sites at national level, for the National Radiological Environmental Monitoring programme.
Related activities in the field on individual monitoring include the collaboration in working groups (IPAC-Instituto Português para Acreditação), as well as training to outside collaborators, namely, R. Esmail from the Ministry of Health of the Republic of Mozambique and the preparation of a MSc thesis (L. Freire).

1 PEPAP Trainee (left July); 2 MSc student; 3 FCT EURATOM grant (left September); 4 ITN grant; 5 Rep Mozambique, Min. of Health

Central Dose Registry: Collection and Analysis of Occupational Dose data

M.B. Martins, J.G. Alves

ITN is entrusted the task to create and maintain a Central Dose Registry (CDR) for occupational exposure, according to Decree-Laws 165 and 167 of July 2002. Presently the CDR contains the occupational exposure data of the workers monitored in Portugal in the period 1957-2006. The data stored at the CDR consists mainly on the external dose evaluations in terms of the operational quantities $H_p(10)$ and $H_p(0.07)$ and on information concerning the worker's affiliation and type of activity. In 2007 the CDR increased the frequency of data transfer and exchanged information with the six monitoring services operating in Portugal on a quarterly basis. Considering the need for more effective links with the monitoring companies the communication procedure is presently being revised. The database structure of the CDR is also being improved.
The analysis of the occupational dose data stored at the CDR is also an aim of this project, particularly in the case of high dose activities. In 2007 special attention was given to staff doses in cardiology and interventional radiology. The annual whole-body doses evaluated in the period 1999–2003 were analyzed and used to derive the distribution of workers by dose intervals for every profession. The respective annual average doses and annual collective doses, as well as, the total average and total collective doses were also determined.

Harmonization of Individual Monitoring in Europe

J.G. Alves, P. Ambrosi[1], D. Bartlett[2], L. Currivan[3], J.W. van Dijk[4], E. Fantuzzi[5], V. Kamenopoulou[6], E. Vartiainen[7], M. Figel[8], A.M. Romero[9], D. Kluszczynski[10], A. McWhan[11], H. Stadtmann[12], H. Roed[13], B. Vekic[14]

The previous EURADOS (European Radiation Dosimetry Group) WG2 projects on *Harmonization of Individual Monitoring in Europe* active in the 1996-2000 and 2001-2005 periods and were respectively funded under FP 4 and 5 had reached its end. However the EURADOS Council found necessary the continuation of the project and decided to fund a core group for the period Jun-2005 till Jan-2007 with two main tasks: the review of EUR 14852 – Technical recommendations for monitoring individuals occupationally exposed to external radiation, and the preparation of self-sustained intercomparisons in Europe. WG2 was chaired by V. Kamenopoulou and in order to prepare both tasks Subgroup 1 was coordinated by J.G. Alves and Subgroup 2 by M. Figel. Subgrop 1 was given a further task: should the European Commission publish a call for a tender on this issue, SG1 should be prepared and present a proposal. The work attributed to WG2 including the preparation of a proposal to tender issued by EC-DGTREN was completed and a final report was prepared and presented to the EURADOS Council at the annual meeting held in Madrid in January 2007.

1 PTB, Germany; 2 HPA, United Kingdom; 3 RPII, Ireland; 4 NRG, Netherlands; 5 ENEA, Italy; 6 GAEC, Greece; 7 STUK, Finland; 8 GSF, Germany; 9 CIEMAT, Spain; 10 NIOM, Poland; 11 BNFL, UK; 12 ARCS, Austria; 13 NIRH, Denmark; 14 RBI, Croatia.