

European Radiation Dosimetry Group • Mekelweg 15 • 2629 JB Delft

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Subject : Exchange of information on internal dosimetry projects carried out within the EU

Participants : George Etherington, Mike Bailey, Wolfgang Wahl, François Paquet (apologised), John Stather, Christian Wernli, Christian Schmitzer, Janwillem van Dijk, Maria Antonia Lopez, Elena Fantuzzi, Alain Rannou, Alexander Brandl, Pascal Pihet

Executive summary

A meeting was organised at ARCS (Austrian Research Center Seibersdorf) on September 9 to exchange information on the projects carried out within the EU in the area of internal dosimetry. The presentation of the projects show their complementarity to cover different aspects of this wide and complex area of research and expertise from fundamental studies to practical applications in radiation protection:

- scientific basis and development of internal dosimetry models (project BIODOS) ;
- database of biokinetic parameters following entry into the body of radionuclides through ingestion, injection or wounds (RBDATA concerted action) ;
- normal or perturbed biokinetic behaviour of radionuclides, guidance for treatment for specific radionuclides (EULEP working group) ;
- design and implementation of monitoring programmes for internal exposure (project OMINEX) ;
- reliability of internal dose assessments from monitoring data (project IDEAS) ;
- provision of faster and more reliable monitoring techniques (project IDEA) ;
- harmonisation (legal, dosimetric, quality aspects) of individual monitoring, and integration of monitoring for external and internal exposures (EURADOS working group).

Furthermore, EULEP and EURADOS contribute to dissemination of the results achieved in these programmes.

The annex summarizes the information package exchange during the meeting. The discussions raised the following issues:

- The exchange of information on the various projects performed during the meeting met the expectation of the coordinators and should continue. This information will be made available to the partners of the different

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projects which can be achieved by disseminating the present information package and through the EULEP and EURADOS web sites.

- Although the projects arose from different initiatives and have been setup at different times, it became evident and satisfactory that the process of consultation between the groups has led to a set of complementary programmes. Links between projects should, however, be strengthened and preserved. Such clustering initiatives are to date not appropriately formalised and funded either within the current projects, nor within the networks programmes. Examples were shown where immediate benefit can be expected with a more efficient synergy concerning e.g. comprehensive lists of contacts, combined inquiry actions using optimised questionnaires, workshop programmes, etc..
- These complementary projects represent a comprehensive network of skilled EU laboratories in the various fields of research and monitoring related to internal dosimetry. Efforts should be made using EURADOS and EULEP to demonstrate this expertise and capability. These networks can increase the links between those project groups and international committees, and in particular with the work of ICRP as far as internal dosimetry is concerned.
- Furthermore, the present network has the capability to promote new coordinated actions on priorities identified for the 6th framework programme. It is in a unique position to contribute towards transfer of research issues to users with a better chance to meet the expectations of national bodies related to concerns about internal exposure for the public, an issue with high political profile.
- A number of actions can readily be identified towards the consolidation of the present cluster:
 - to investigate the extent to which the surveys on internal dose monitoring practice being carried out the OMINEX group will meet the needs of the EURADOS WG on harmonisation of individual monitoring ;
 - to investigate the association of a workshop programme on individual monitoring and the IDEAS workshop and to identify the appropriate accompanying measure with DG RTD and DG Environment ;
 - to motivate scientific communications in forthcoming forums:
 - EURADOS annual meeting, January 23-25, 2001 (contact: A. Rannou, C. Wernli) ;
 - EULEP annual meeting, March 3-8, 2001 (contact: D. Taylor);
 - Oxford Workshop on Internal Dosimetry, September, 9-12, 2001 (contact J. Stather).
 - to plan in Oxford (tentatively, on the afternoon of Thursday 12 September, following the workshop) a second meeting devoted to the exchange of information between projects taking advantage of the presence of many project partners.
 - to disseminate the present report and information package using EURADOS and EULEP web sites and in their joint Newsletter. A route map of the current projects will be designed for showing the present network. The newsletter will also include a report on the latest ICRP Committee 2 meeting with emphasis on priorities for internal dosimetry in the next four years.

It is agreed that information of further actions will be circulated within the present cluster of coordinators using the e-mail list enclosed. The coordinators are responsible for distributing the present report and following information to their partners.

The participants expressed their thanks to ARCS for offering the opportunity of the present meeting in conjunction with the EURADOS working group meeting on "Harmonisation of Individual Monitoring" and for their excellent hospitality.

To: participants

Copies: C. Desaintes
G.N. Kelly
D. Teunen
R. Guilmette
J.W. Hopewell
H. Doerfel
D. Taylor

Annex:

Contact group

Meeting agenda

Internal dosimetry projects carried out within the EU

ANNEX 1

INTERNAL DOSIMETRY PROJECTS CARRIED OUT WITHIN THE EU

Contact group

Project	Coordinator	Centre	E-mail
BIODOS	François Paquet	IPSN, France	francois.paquet@ipsn.fr
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	Alexander Brandl	ARCS, Austria	alexander.brandl@arcs.ac.at
EURADOS WG2	Maria Antonia Lopez	CIEMAT, Spain	ma.lopez@ciemat.es
	Helena Fantuzzi	ENEA, Italy	fantuzzi@bologna.enea.it
	Janwillem van Dijk	NRG, The Netherlands	j.vandijk@nrg.nl.com
EULEP WP5	David Taylor	University of Wales, United Kingdom	davtay@globalnet.co.uk
	John Stather	NRPB, United Kingdom	john.stather@nrpb.org.uk
EURADOS	Alain Rannou	IPSN, France	alain.rannou@ipsn.fr
	Christian Wernli	PSI, Switzerland	christian.wernli@psi.ch

ANNEX 2 (agenda)

Exchange of information on internal dosimetry projects carried out within the EU.

Vienna, September 9, 2001, 10 a.m

City Office of the Austrian Research Centre Seibersdorf
Kramergasse 1, Vienna

Participants : George Etherington, Mike Bailey, Wolfgang Wahl, François Paquet (apologised), John Stather, Christian Wernli, Christian Schmitzer, Janwillem van Dijk, Maria Antonia Lopez, Elena Fantuzzi, Alain Rannou, Alexander Brandl, Pascal Pihet

The meeting is first aimed at an exchange of views in the field of internal exposure knowing the scope of the various and complementary projects which are funded under the 5th Framework Programme. Beyond this objective, we hope that our exchange can lead to the identification of possible ways to maintain and improve close interactions between our groups, possibly to establish links with other countries and international programmes.

The aim of the meeting is to have active and open discussions. We are proposing to address the following questions. Please feel free to suggest any additional topics.

1) Information exchange on the projects currently in progress

Information on the projects (some at least) can be found in Cordis site and on the final report of the 4th FWP concerted actions in the Newsletter site (www.euradnews.org, issue nr 7).

To elaborate and clarify, it would be useful to give for each project a brief presentation of the scope and the partners involved:

BIODOS – François Paquet (represented by Mike Bailey and Pascal Pihet)

RBEDATA – Mike Bailey

OMINEX – George Etherington

IDEAS – Mike Bailey

IDEA – Christian Schmitzer

EURADOS WG – Janwillem van Dijk, Maria Antonia Lopez

EULEP WP5 – John Stather

... any other project in preparation.

As much of the work being carried out will feed into ICRP work on Internal Dosimetry, John Stather will give a short report on the ICRP programme and the issues of the ICRP meeting which is just held before we meet in Vienna.

2) Form and structure of future meetings for information exchange.

Beyond the question of maintaining regular meetings at the coordinator level, some concrete issues may be usefully discussed. For example, it would perhaps be useful to provide interested people and organisations with a "route map" as to how our research consortia represent an efficient (potential at least) network of experienced groups for co-ordinated work in the area of internal dosimetry bringing together expertise from across the community.

Among possible concrete actions, several opportunities can already be found for motivating further exchange of scientific communications between our groups and with other scientists. These include the regular EULEP and EURADOS annual meetings, the Oxford Workshop on Internal Dosimetry (September 2002) and a Workshop on Individual Monitoring planned by the EURADOS WG. During our meeting, proposals can be discussed for stimulating contributions to such seminars.

3) Communication of the results of the Meeting

Depending on our discussions, in what form do we communicate the issues raised at the meeting (minutes, memorandum of agreement, Newsletter report, information on web site) and to whom ?

ANNEX 3

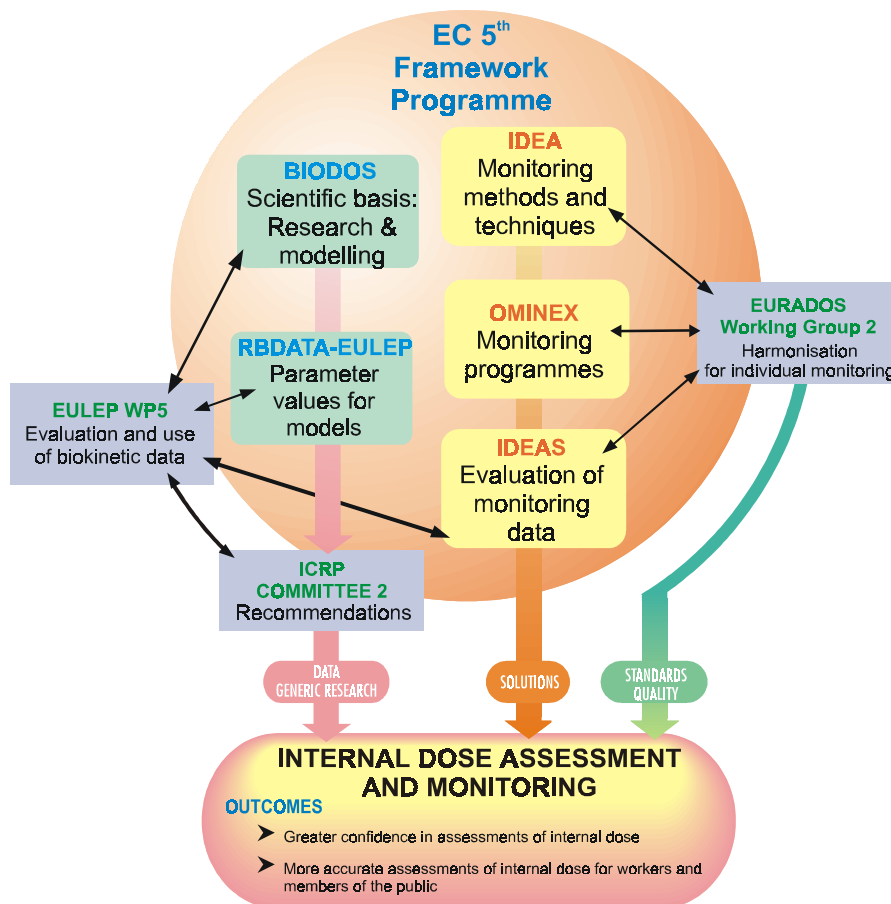
Internal dosimetry projects carried out within the EU.

Seven actions are engaged in the area of internal dosimetry under the 5th Framework Programme of the European Commission (EURATOM).

Three projects (OMINEX, IDEAS, IDEA) are carried out within the key action programme "Nuclear Fission" under the headline "Radiation protection/monitoring and assessment of occupational exposure". The BIODOS project is an RTD action of generic nature in radiological sciences. Three additional actions are part the network programmes carried out by the scientific association EULEP (European late effects project group) and EURADOS (European radiation dosimetry group).

These projects form a comprehensive set of actions covering the complex area of internal dosimetry research and expertise from fundamental studies to practical applications in radiation protection.

INTEGRATION OF EC, EURADOS AND EULEP WORK ON INTERNAL DOSIMETRY



Up to 13 countries from EU (A, F, UK, S, D, I, NL, FIN, B, E, EL, DK, IRL) and associated countries and NIS countries (CH, PL, HU, Slovenia ,Ukraine) currently contribute to these projects. They form a network of highly skilled laboratories and services with the capability of performing research and transferring the results to users and providing expertise in situations of abnormal internal exposure.

As briefly outlined below, the concrete results expected from these projects include:

- ♦ scientific data,
- ♦ models,
- ♦ proposals (innovative techniques, methods, protocols),
- ♦ different surveys (current practices and methods, standards, international recommendations),

disseminated in the form of scientific publications and communications, but also reviews, catalogues and databases which contribute to maintain a high level of expertise within the EU.

The dissemination of the project information is enhanced by the activities of EULEP and EURADOS. Furthermore, the recognition of such a network may increase the relationships between those project groups and international bodies such as ICRP, ISO, or AIEA towards the identification of needs and research priorities.

A wide platform of exchange may be maintained in this way which is realized in international intercomparison exercises, training courses, workshops and conferences.

Project BIODOS

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: Biokinetics and dosimetry of internal contamination

Contract: FIGD-CT2000-00053 (01/2001 – 06/2004)

Scope

The radiation doses received by individuals from radionuclides which enter the human body cannot be measured but must be calculated. Assessments of doses and risks to workers exposed to radionuclides and to the public following environmental releases require biokinetic models which describe the behaviour of the radionuclides from their entry into the body until their final elimination. The overall objective of this project is to improve the scientific basis of the existing models and to provide new or improved models. Realistic and scientifically sound estimates of the doses received in different situations will be given, as well as assessments of the uncertainties in these estimates. The project combines established experimental and mathematical modelling expertise, including human, animal and in vitro studies.

The work comprises two projects focused respectively on the delivery of new systemic, digestive tract and breast-milk models and on the improvement of the human respiratory tract model (HRTM) of the International Commission on Radiological Protection (ICRP).

The first project aims to provide models targeting specific uncertainties, including: estimates of dose and risk from radionuclides ingested by adults and children; estimates of the transfer of radionuclides to breast-milk and doses to infants; the development of systemic models to improve the interpretation of measurements of radioactivity excreted in urine and faeces, or of direct measurements of whole body retention; the study of the importance of heterogeneous distribution of dose within tissues and cells.

The second project forms a comprehensive research programme on the inhalation of radionuclides. It addresses four areas of uncertainty, i.e. ultrafine particles (<0.1 µm); inter-subject variation; absorption into blood; clearance mechanisms. The approach to each is multidisciplinary, typically including: production of test particles; in vivo measurements of deposition and clearance; in vitro cell studies of mechanisms; complementary theoretical modelling. The results will provide a substantial increase in the amount of human experimental data on deposition and clearance, and an improved understanding of the underlying mechanisms, thus providing greater confidence in their treatment by the HRTM, and in doses assessed using it.

Overall, this project is expected to provide a substantial body of new information on radionuclide behaviour in the human body and new or improved approaches to biokinetic modelling. This should lead to improved confidence in the calculation of radiation doses, and the assessment of risks following accidental or environmental intake of radionuclides, by workers or members of the public, including young children.

Main expected issues

- Scientific data relevant to:
 - the biokinetics and microdistribution of radionuclides ;
 - the uncertainties of internal dose assessment ;
- Biokinetic models.

Meetings, workshops, ...

Contractor meetings

Participation to ICRP task groups

Contribution to the Workshop on Internal Dosimetry of Radionuclides, Oxford, September 9-12, 2002

Partnership

- Institut de Protection et de Sûreté Nucléaire (IPSN), F - Co-ordinator
- Universitaet Salzburg (USBG), A
- National Radiological Protection Board (NRPB), UK
- Technoorg-Linda Co . Ltd. (TL), S
- Karolinska Institutet (KI), S
- Swedish Radiation Protection Institute (SSI), S
- Commissariat à l'Energie Atomique (CEA), F
- Forschungszentrum fuer Umwelt und Gesundheit (GSF), D
- Institut für Aerosol-Medizin (INAMED), D
- Bundesamt fuer Strahlenschutz (BfS), D
- Universita degli Studi di Milano (UMIL), I
- University of Wales, Cardiff (UWC), UK
- University of Rostock (UROS), D
- Delft University of Technology (TUD), NL

Project RBDATA-EULEP

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: Radionuclides biokinetics database (EULEP)

Contract: FIR1-CT2000-20056 (01/2001 – 12/2003)

Scope

The overall aim of this Concerted Action is to improve the reliability of assessments of intakes of radionuclides and of the resulting doses delivered either to workers or, in the case of accidental releases to the environment, to the general public.

The main objective is to carry out a review of the biokinetic behaviour of selected radionuclides in the chemical forms that are currently encountered in facilities within the EU, following their entry into the human body by any route. This work will provide strong support for the International Commission on Radiological Protection by providing literature reviews, which are essential for the development of the new biokinetic models that are required for the forthcoming revision of Publications 30, 54 and 78 on exposure of workers to radioactive materials. The main emphasis will be on exposure to materials encountered in industry. Data will be analysed using a common methodology, and then entered into an existing electronic database for inhaled materials. The database will be broadened to include biokinetic data following entry into the body through ingestion, injection or wounds. The focus will be to provide easy access to the database, and guidance on expertise and methodology.

There are two main aspects to this project:

Task 1 : Review of radionuclide biokinetics

The consortium will collate and analyse information from the literature on experimental studies relating to the biokinetics of compounds of radionuclides and fission products of importance for occupational and public exposure. The work will particularly focus on the review of in vitro and in vivo experiments with materials likely to be inhaled, and the derivation, from those data, of values of absorption parameters which can be used with the ICRP Publication 66 Human Respiratory Tract Model to calculate doses from intakes of radionuclides. Other reviews will provide biokinetic parameters for ingested materials, and for the systemic behaviour (including excretion) of radionuclides after entry into the blood either by injection or after wound contamination. In order to adopt a uniform approach, the calculations will be done in collaboration between the participants. A parameter-fitting computer program will provide technical support for these calculations. A wide range of radionuclides will be covered, with emphasis on the actinides (e.g. uranium, plutonium) and fission products (e.g. caesium, strontium). An aim is to provide easy access to the database on a website.

Task 2 : Guidance on methodology to determine biokinetics

The second activity will focus on the transfer of expertise on methodology and the development of common approaches. This will include experimental methods related to biokinetics such as inhalation facilities, in vitro dissolution techniques, and analytical methods, and also computer modelling to derive absorption parameter values from experimental data. Short workshops on some of these topics will be organised as a contribution to the education of young scientists in the general area of radiation protection dosimetry.

Main expected issues

- Review of biokinetic data relevant to occupational and public exposure ;
- Database ;
- Expertise and methodology on biokinetic data and their determination.

Meetings, workshops, ...

- Contractors Meetings ;
- Contribution to the Workshop on Internal Dosimetry of Radionuclides, Oxford, September 9-12, 2002 ;

- Training workshops planned. Note that dates and locations are provisional at this time and subject to change:
 - Experimental techniques to investigate radionuclide biokinetics: June 2002 at Saclay, France ;
 - Interpretation of experimental data on radionuclide biokinetics: March 2003 at Reims, Germany.

Partnership

- National Radiological Protection Board (NRPB), UK - Co-ordinator
- Institut de Protection et de Sûreté Nucléaire, IPSN, F
- Commissariat à l'Energie Atomique (CEA), F
- Forschungszentrum für Umwelt and Gesundheit, GmbH (GSF), D
- AEA Technology (AEAT), UK
- University of Wales, Cardiff (UWC), UK
- European Late Effects Project Group (EULEP)

EULEP Working party 5

Status

Reference: <http://www.cordis.lu/fp5-euratom/home.html>
Title: Biokinetics and dosimetry of internal contamination
Proposal: FIS5-1999-00053
Contract: FIGD-CT2000-00053 (01/2001 – 06/2004)

Scope

EULEP Working Parties are designed to provide an opportunity for members to broadly examine issues related to radiation effects research under the five topic areas of the various Working Parties. They will also allow for a better achievement of the overall objectives of the EC Research Programme through integrating knowledge and results from the individual projects and other relevant work within EULEP member laboratories.

The main objective of WP5 is the evaluation of normal or perturbed kinetic behaviour of radionuclides in humans or other, mammalian species with special references to the assessment of internal dose. WP5 is closely integrated with RBDATA-EULEP, a database of information on effects of incorporated radionuclides, where all the published results of the WP members will be included. Information on treatment modalities and their efficacy following accidental intake of radionuclides, especially by decorporation therapy will be used for the preparation of radionuclide- and compound-specific guidance notes for physicians. The Working Party is also seeking to identify laboratories in Associated Member States which are carrying out significant research into radionuclide biokinetics and which could be potential partners in an enlarged network.

Main expected issues

- Evaluation Reports and Guidance Notes

Meetings, workshops, ...

- EULEP Working Party 5 Coordination and Reporting meetings 4 and 6 March 2002 (Schloss Reisenburg, Germany) ;
- The following two training workshops are planned under the auspices of RBDATA-EULEP (note that dates and locations are provisional at that time and subject to change):
 - Experimental techniques to investigate radionuclide biokinetics: June 2002 at Saclay, France ;
 - Interpretation of experimental data on radionuclide biokinetics: March 2003 at Reisenburg Germany ;
- Members of the Working Party will contribute to the Oxford Workshop on Internal Dosimetry of Radionuclides, Oxford, September 9-12, 2002 (information: john.stather@nrpb.org.uk or http://www.nrpb.org.uk/technical_services/training/oxfordworkshop.htm)

Partnership

EULEP partnership

Project OMINEX

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: Optimisation of monitoring for internal exposure

Contract: FIKR-CT2000-00046 (10/2000 – 01/2004)

Scope

The economic costs of monitoring and control of internal exposures in the workplace are usually significantly greater than the equivalent costs for external exposures. There is therefore a clear need to ensure that resources such as manpower, sample collection facilities, allocation of usage of measurement equipment, funds for capital investment in laboratory facilities, and facilities for interpretation of results are all employed with maximum effectiveness. The overall aim of the project is therefore to consider how to optimise the design and implementation of internal exposure monitoring programmes in a way that will make best use of these resources. A concern that is sometimes expressed is that this type of approach could result in standardised monitoring programmes that may not take account of conditions prevailing at particular industrial locations. This is not the aim here; rather, the outcome should be a common approach to the process of designing and implementing internal dose monitoring programmes throughout the EU.

The first main objective of the project is to carry out a critical evaluation of arrangements for internal exposure monitoring within the European nuclear industries. A survey of monitoring programmes currently in use within the EU is therefore being carried out, and information on the financial costs of implementing and running internal dose monitoring programmes is also being collected.

Optimisation of monitoring programme design will be carried out by evaluating costs and “benefits”. The latter will be quantified primarily by assessing the accuracy with which intakes and/or committed doses are determined by particular monitoring methods and measurement techniques. The second main objective will therefore be to investigate and quantify the major sources of uncertainty in internal doses assessed from monitoring measurements. Addressing the issue of uncertainties in internal dose assessments is of course a significant task, and is one of the main innovative aspects of the project.

The third and central objective is to use this information to develop guidance on monitoring. Guidance on incident and routine monitoring will be developed for a range of specific examples of exposures to industrial materials. This will cover overall design, choice of monitoring method(s) (eg excretion monitoring vs air sampling), choice of technique(s) (eg alpha spectrometry vs. mass spectrometry), monitoring intervals, measurement frequency, required measurement sensitivity, and so on. Guidance will take account of recent developments in biokinetic modelling and, most importantly, experimental studies with industrial materials.

Main expected issues

- Surveys of current internal dosimetry monitoring practices ;
- Investigation and quantification of the major sources of Uncertainty in assessment assessment of internal dose ;
- Advice and guidance on design of monitoring programmes.

Meetings, workshops, ...

- Contractor meetings ;
- Contribution to the Workshop on Internal Dosimetry of Radionuclides, Oxford, September 9-12, 2002 ;
- Training Course on design of monitoring programmes and interpretation of results (late 2003).

Partnership

- National Radiological Protection Board (NRPB), UK - Co-ordinator
- Institut de Protection et de Sureté Nucléaire (IPSN), F
- Radiation and Nuclear Safety Authority (STUK), FIN
- Belgian Nuclear Research Centre (SCK•CEN), B
- Electricité de France (EdF), F
- Teollisuuden Voima Oy Nuclear Services (TVONS), FIN
- Commissariat à l'Energie Atomique (CEA), F

Project IDEAS

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: General guidelines for the estimation of committed dose from incorporation monitoring data

Contract: FIKR-CT2001-00160

Scope

Background - During the last few years the ICRP has developed a new generation of more realistic internal dosimetry models, including the Human Respiratory Tract Model and recycling systemic models for actinides. The 3rd European Intercomparison Exercise on Internal Dose Assessment carried out in the framework of EULEP/EURADOS/UIR concerted action "Environmental and occupational dosimetry: An integrated approach to radiation protection covering radioecology, dosimetry and biological effects" gave special consideration to the effects of the new models and the choice of input parameters on the assessment of internal doses from monitoring results [Doerfel et.al. 2000]). It also took into account some aspects which have not been considered in previous exercises, such as air monitoring, natural radionuclides, exposure of the public, artificially created cases and artificially reduced information. Seven case scenarios were distributed, dealing with H-3, Sr-90, I-125, Cs-137, Po-210, U-238 and Pu-239, and covering different intake scenarios and all monitoring techniques. Results were received from 50 participants, 43 representing 18 European countries and 7 from five countries outside Europe. So it was by far the largest exercise of this type carried out to date. Most participants attempted more than half of the cases. Thus on average there were 35 responses per case with a total of about 240 answers, giving a good overview of the state of the art of internal dosimetry. The results in terms of intake and committed effective dose appeared to be log-normally distributed with the geometric standard deviation ranging from 1.15 for the cases dealing with H-3 and Cs-137, up to 2.4 for the cases dealing with Pu-239. These figures reflect to large differences in the individual results which varied in worst cases within a range of five orders of magnitude. A key feature of the exercise was a Workshop, involving most of the participants, at which each case and the various approaches taken to assessing it were discussed. Several reasons for the differences in the results were identified, including different assumptions about the pattern of intake, and the choice of model. The most important conclusion of the exercise was the need to develop agreed guidelines for internal dose evaluation procedures in order to promote harmonisation of assessments between organisations and countries, which has basic importance in EU countries.

Objectives of the project - All the intercomparison exercises have shown that there is a wide variety of evaluation procedures, depending on the experience and the skill of the dosimetrist as well as on the hardware and software tools. However, for a given set of internal monitoring data in terms of body/organ activity and/or urine/faecal activity there can be only one best estimate for the intake and the committed dose equivalent. This best estimate is well defined by the monitoring data, the biokinetic models for the description of the metabolism, and – if available - some additional information, such as time of intake, route of intake, aerosol size, absorption type, f1-factor and eventually previous internal exposures. The aim of the project is to provide general guidelines which enable everybody to derive this well defined standard estimate for any given set of data. This of great importance for the harmonisation of internal dose assessment in Europe, and elsewhere.

The results of internal dosimetry in terms of committed dose should be comparable to the results of external dosimetry with respect to accuracy and reproducibility. If two persons are exposed to the same external irradiation field then their dosimeter readings are consistent with each other, and they are considered to be the best estimate of the exposure. In some special cases the dose reading might be wrong because of some uncommon photon energy or some uncommon radiation incidence angle, but nobody worries about it so long as the dose reading is below the investigation level. In internal dosimetry we should come to a similar philosophy, that means if two persons have the same internal exposure then the results of internal monitoring in terms of committed dose should be consistent with each other, and the results should be considered to be the best estimate. Similarly, in some special cases the results might be wrong because of some uncommon path of intake or some uncommon physical/chemical properties of the incorporated material, but nobody should worry about it as far as the committed dose is below the investigation level.

So, in internal dosimetry the reproducibility of the results should have the same priority as in external dosimetry. This means, first of all, that the monitoring procedure should be optimised in such a way that the monitoring results, in terms of activity, are representative for the real exposure. This optimisation will be provided by the

OMINEX project (Optimisation of Monitoring for Internal Exposure). The second step is the optimisation of the evaluation of the monitoring data, which will be provided by the IDEAS project. So both projects focus on the same goal, but with clearly distinct approaches: OMINEX will optimise the procedures for carrying out monitoring, and IDEAS will optimise the procedures for assessing doses from the results of monitoring.

Main expected issues

- survey of incorporation cases ;
- description and comparison of internal dosimetry evaluation software packages ;
- guidelines on evaluation of monitoring data for internal exposure ;
- 4th European Intercomparison Exercise on Internal Dose Assessment.

Meetings, workshops, ...

- contractor's meetings ;
- EURADOS workshops ;
- Workshop "Discussion of the common strategy for evaluation of monitoring data" (early 2003) ;
- Workshop "Results of the 4th European Intercomparison Exercise on Internal Dose Assessment" (early 2004).

Partnership

- Forschungszentrum Karlsruhe, Germany (FZK) - Co-ordinator
- National Radiological Protection Board (NRPB), UK
- Institut de Protection et de Sûreté Nucléaire (IPSN), F
- KFKI Atomic Energy Research Institute (AEKI), Hungary
- Belgian Nuclear Research Centre (SCK•CEN), B
- Electricité de France (EdF), F
- Radiation Protection Institute, (RPI) Ukraine
- Italian National Agency for New Technology, Energy and the Environment (ENEA), I

Project IDEA

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: Internal Dosimetry - Enhancements in Application

Contract: FIKR-CT2001-00164

Scope

This project is all about one IDEA. Numerous methods are well known and established in laboratories which could enhance internal monitoring techniques – in principle. However, these benefits are not available to occupational internal dose assessments, because the applicability of such methods for routine application has not been demonstrated sufficiently. These enhancements in application of internal dosimetry – both in accuracy and speed - are the overall objective of this project.

The proposal aims at the work program objectives, namely to provide faster and more reliable, i.e. demonstrably proven, monitoring techniques (both in-vivo and bio-assay) for better operational monitoring. The proposal does not aim primarily at the development of new methods. Enhanced methods for occupational internal dosimetry, i.e. routine application, are the target area.

In order to provide enhanced protection in the field of internal exposure it is of potential importance

- to verify and apply new measurement concepts,
- to enhance existing measurement concepts,
- to improve calibration techniques for individual assessment, and
- to apply better monitoring and calibration techniques to reduce uncertainties in the evaluation of whole and partial body activity and individual intakes for dose assessment.

The goals and the specific aspect of this work are the

- faster and/or more reliable bio-assay monitoring techniques:

Individual monitoring of incorporated radionuclides without sufficient photon emissions has to be performed by bio-assay techniques. Preferentially, measurements on urine samples represent the uptake of radionuclides into the systemic parts of the body. However, for a number of radionuclides of high radiotoxicity the sensitivity of currently applied monitoring techniques (e.g. alpha spectrometry) is hardly sensitive enough. Therefore, the possibility of employing inductively coupled plasma mass spectrometry (ICP-MS) for faster results at lower limits of detection shall be investigated and validated.

- faster and/or more reliable in-vivo monitoring techniques:

Direct measurements of photon and beta emissions from the human body provide an excellent tool for the assessment of activity of incorporated radionuclides. But for a number of radiologically important radionuclides the current limits of detection are hardly adequate to meet the requirements of given monitoring programmes. This activity is aimed to apply innovative detector systems with enhanced readout devices to provide more accurate and reliable information.. Improved calibration techniques applying phantoms will also result in more reliable data.

The objectives to be realised may be summarised as follow:

- (a) Evaluation of current situation / enhancement potential in routine monitoring of internal exposure
- (b) Potential of modern technologies for improvements of in vivo monitoring techniques
- (c) Potential of recent bio-assay monitoring techniques for assessment of internal exposure
- (d) Consequences for operational monitoring of individual intakes for occupational internal exposure

Main expected issues

- Improvement feasibility studies for *in vivo* and ICP-MS techniques, coupled with a benefit estimate of the various improvement options ;
- *In vivo* measurements: verification and application of new technologies and concepts, improved calibration methods using phantoms ;
- ICP-MS measurements: measurement procedures, calibration, validation, data sets ;
- Recommendations and standard operating procedures for the use of new techniques ;
- Detailed cost-benefit analyses for new techniques.

Meetings, workshops, ...

- Contractor's meeting
- EURADOS workshops

Partnership

- Austrian Research Centers (ARCS) , A - Co-ordinator
- Institut de Protection et de Sûreté Nucléaire (IPSN), F
- KFKI Atomic Energy Research Institute, Hungary (AEKI)
- National Research Center for Environment and Health in Neuherberg (GSF), D

EURADOS Working group 2

5th EC Framework programme (EURATOM):

Reference: <http://www.cordis.lu/fp5-euratom/home.html>

Title: Harmonisation of Individual Monitoring in Europe (Dosimetry network)

Contract: FIR1-CT-2000-20104 (01/2001 – 12/2003)

Scope

The working group formed for the EURADOS work package 3 "Forming a group dealing with the harmonisation of individual monitoring in Europe and information on new techniques in this field" can be considered to be a continuation of the action group on "Harmonisation and Dosimetric Quality Assurance in Individual monitoring for external radiation". This action resulted in three reports that were published in a special issue of Radiation Protection Dosimetry (Radiat. Prot. Dosim 89 (1-2) 2000) and the "Workshop on Individual Monitoring of External Radiation" held in Helsinki from 4 to 6 September 2000. It was felt that the sharing of information between the members of the action group and the liaison of them with colleagues in the dosimetry, metrology and regulatory communities in their respective countries, formed a valuable network. The work package for the new working group concurs with this opinion and extends the network to the candidate Member States of the European Union.

The WG approaches individual monitoring by integrating legal, dosimetric and quality aspects. It consists in 4 task groups dealing with:

1) *The implementation of standards by dosimetric services ;*

2) Integration of results of internal and external dosimetry

It was considered necessary that the newly formed working group include other aspects of exposure in their work package. Harmonisation of methods for assessing the dose due to internal contamination and that measured by workplace monitoring will enable the integration of all dosimetric methods.

The investigations include:

- a catalogue of methods and services that deal with assessing the dose due to internal exposure: the aim of the study will be to present an overview of in-vivo and in-vitro techniques for internal exposure measurements, as well as the different tools to use for internal dose assessment, from the approved internal dosimetry services in Europe
- a survey of intercomparison exercises (in vivo measurement, bioassay, aerosol monitoring, dose assessment) carried out in this area ;
- the compilation and dissemination of information on legal requirements, quality assurance, quality control, calibration, traceability of results and standards to apply.

They refer to international recommendations and guidelines : ICRP Publications (ICRP60, 61, 66, 67, 68, 69, 71, 72, 78) ; ISO recommendations (9001, 9002) ; ANSI N 13.30 "Standard Performance Criteria for radiobioassay" ; IAEA Safety Serie No. RS-G-1.2 ("Assessment of Occupational Exposure Due to Intakes of Radionuclides").

3. *Electronic dosimeters for individual monitoring and other new developments ;*

4. *Quality assurance, quality control and reliability of dosimetric systems.*

Several aspects of this proposed program have ground in common with the work of other working groups and projects in external dosimetry and in internal dosimetry. Liaison with colleagues working on such programs might add to the efficiency of the work and must certainly prevent duplication of work.

Main expected issues

- inquiry by approved dosimetry services ;
- catalogues of methods and practices ;
- survey of international recommendations.

Meetings, workshops, ...

- WG meetings and EURADOS workshops ;
- Workshop on Individual Monitoring (project).

Partnership

- ♦ NRG Radiation & Environment, NL – chairmanship
- Austrian Research Centers (ARCS)
- Institut de Protection et de Sureté Nucléaire (IPSN), F
- Belgian Nuclear Research Centre (SCK•CEN), B
- National Research Center for Environment and Health in Neuherberg (GSF), D
- Health inspectorate, Republic of Slovenia
- Italian National Agency for New Technology, Energy and the Environment (ENEA)
- Radiation and Nuclear Safety Authority (STUK), FIN
- British Nuclear Fuel, BNFL, UK
- ♦ CIEMAT, E
- ♦ Direcção-Geral do Ambiente, P
- ♦ Greek Atomic Energy Commission, GAEC, EL
- ♦ Institute of Nuclear Physics, INP, PL
- ♦ Universitat Politècnica de Catalunya, INTE, E
- ♦ Paul Scherrer Institute, CH
- ♦ Physikalisch Technische Bundesanstalt, PTB, D
- ♦ Risoe National Laboratory, DK
- ♦ RPII Dublin, IRL
- ♦ Swedish Radiation Protection Institute, SSI, S