



European ALARA Newsletter

Editorial

The implementation of the ALARA principle in the medical and industrial fields is certainly one of the most challenging issues that health physicists and RP professionals will have to deal with during the next decade. Numerous presentations made on these topics at the IRPA 12th Conference in Buenos-Aires have confirmed this. It raises even more crucially the need for enhancing radiological protection culture, especially outside the nuclear sector. Thus, the initiative taken by the Radiological Protection Societies to establish a

dedicated working group to prepare IRPA Guiding Principles on the improvement of radiological protection culture worldwide is very welcome. Moreover, the integration of the revised ICRP Recommendations for the system of radiological protection into national regulations will undoubtedly reinforce the role of optimisation (ALARA) in reducing occupational and public exposures. Maybe we can say that the RP profession is reaching a major turning point in the movement toward a common way of doing, organizing, and managing radiological protection: towards shared ethics?

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The 24th issue of the ALARA Newsletter presents current RP issues that have arisen in the industrial and medical sectors. The optimisation of occupational doses - particularly extremity doses - that can be received by practitioners are often neglected: the example given of the important reduction of PET technologists doses achieved in a British dispensary (see paper Tout & al.) shows the potential for progress, especially where new techniques are used. The increase in radiological incidents (see paper Kropacek) and accidents in the medical sector in Europe suggest a need for a real raising of awareness for medical physicians and doctors, surgeons, radiological technologists, manufacturers, RPEs and RPOs, etc. Industrial radiography is another field where the radiological protection culture is low in comparison with the radiological risks generated by the activities: it has to be noted that the ARAN and RECAN networks, both supported by the IAEA, have chosen this topic for their annual workshops (see paper Sadagopan & al.). Furthermore, the feedback exchanges made inside the European NORM network (see paper Schulz) show that there is still a limited knowledge of radioactivity, radiological risks, means of protection and monitoring in the NORM industries community.

Better education and training of the public and workers, improving of radiation source safety, and the recognition of the competences, roles and duties of radiation protection experts are key elements for improving radiological protection culture. It is the role and the creed of EAN to promote and participate to all initiatives that could assist in this process.

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Extremity Dose to Nuclear Medicine Technologists in Routine Clinical Practice with ¹⁸F-FDG

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INTRODUCTION

Positron Emission Tomography (PET) technologists often receive higher doses than staff in other areas of a Nuclear Medicine department due to the higher gamma radiation energy of positron emitting isotopes. At The Christie there has been a substantial increase in ¹⁸F-fluoro-deoxy-glucose (¹⁸F-FDG) PET workload from 426 PET studies undertaken in 2005, 1134 in 2006, 1619 in 2007 and a predicted ~2500 in 2008. Extremity doses in our department were investigated to ensure the estimated annual extremity doses to our staff comply with national legislation [1] and to identify areas where we could change our practice to reduce extremity dose. In Aug-06 extremity doses received by PET technologists were measured and results were used to instruct the design of the dispensary in the planned new PET-CT facility. In Jan-07 a GE Discovery STE8 PET-CT scanner was installed and building works for the new PET-CT facility was completed in Oct-07. Extremity dose measurements during ¹⁸F-FDG administration in the new PET-CT facility were repeated in Nov-07.

METHODS

At the Christie, technologists undergo routine extremity monitoring using finger TLD rings. Although these are good for monitoring routine work, they have the disadvantage of measuring accumulated dose from general nuclear medicine and PET, and it is impossible to identify the individual procedures that contribute the highest dose. Finger TLD rings also rely on staff compliance and have the disadvantage of distance from the finger tip [2,3]. The AEGIS ED2 [4] electronic personal extremity dosimeter (EPD) uses a solid state detector probe (fig 1) to measure the instantaneous dose rate ($\mu\text{Sv}\cdot\text{hr}^{-1}$) and accumulated dose (μSv) at a sample rate of 1 measurement per second for both gamma and beta radiation.



Figure 1. AEGIS ED2 EPD and position of attachment on the index finger

¹⁸F-FDG is delivered 1-3 times a day as a liquid solution of several ml in a glass vial contained in a shielded pot. The vial is removed from the pot using tongs and installed in the dispensing jig. The extremity dose received when installing the multidose vials was measured in Aug-06. Doses were also measured during

the entire ¹⁸F-FDG administration procedure. Technologists were closely monitored and the time of each process was recorded and correlated with the recorded dose data. Measurements were made during syringe preparation, drawing up ¹⁸F-FDG, measuring the activity, transporting ¹⁸F-FDG to the patient, injecting the patient and measuring residual activity.

RESULTS (AUG-06)

On average over 90% of the extremity dose could be attributed to 3 main stages of the administration process (fig 2). A summary of the measurements taken in Aug-06 are shown in tables 1 and 2 (n = 70; mean administered activity = 410MBq).

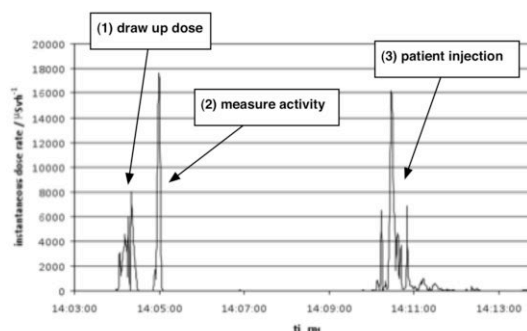


Figure 2. Typical example of instantaneous dose rate during an ¹⁸F-FDG administration

Procedure	Average dose (μSv)	Range (μSv)
Vial installation	45	8 - 138

Table 1. Average and range of extremity doses measured during vial installation (Aug-06)

Procedure	Average dose (μSv)	Range (μSv)
Stage 1: Draw up dose	22	2 - 201
Stage 2: Measure activity	34	5 - 102
Stage 3: Patient injection	32	4 - 161
Total administration	96	25 - 357

Table 2. Average and range of extremity doses measured during ¹⁸F-FDG administration (Aug-06)

Results from each stage were assessed to determine whether improvements could be made to the new PET dispensary. For the 1st stage (drawing up the dose) there are several radiation protection measures already in place including a shielded inverted 45 mm thick lead dispensing jig, 6 mm tungsten syringe shields and 30 mm lead equivalent glass screen (fig 3a). For the 2nd stage (measuring the dose) the dose calibrator was unshielded, raised up on the bench and distant to the dispensing jig. The design for the new PET dispensary

moved the dose calibrator closer to the dispensing jig, sunken in the worktop and surrounded by 50 mm lead shielding (fig 3b).

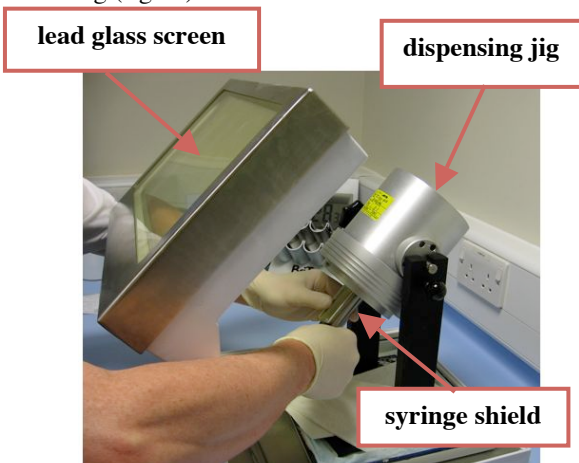


Figure 3a. Local radiation protection shielding

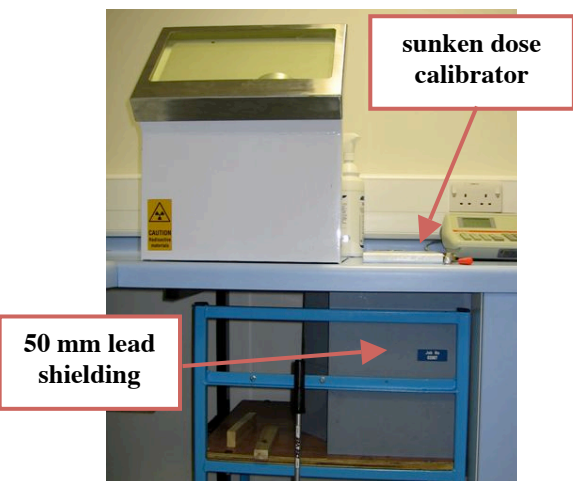


Figure 3b Layout of new PET dispensary

Tongs were only used in 66% of cases and decreased the mean extremity dose by > 50% (average extremity dose 21 μ Sv with tongs, 48 μ Sv without tongs) during the 2nd stage (measuring the activity). All technologists were right handed with the detector on the right index finger. For the 3rd stage (patient injection) current practice is to insert a butterfly 15 mins prior to ¹⁸F-FDG administration which gives staff time to thoroughly explain the procedure and allows the patient to relax before ¹⁸F-FDG administration and uptake. This also has the benefit of reducing time in contact with the active syringe for administration. Further improvements could be dose sharing (increasing the pool of staff responsible for PET administrations) and the possibility of an automatic ¹⁸F-FDG injector, but the cost and practicality of using such a device has to be considered.

RESULTS (NOV-07)

Extremity dose measurements were repeated once the new PET-CT facility was completed. A summary of the measurements taken in Nov-07 are shown in table 3 (n = 33; mean administered activity = 382MBq).

Procedure	Average dose (μ Sv)	Range (μ Sv)
Stage 1: Draw up dose	21	4 - 46
Stage 2: Measure activity	12	4 - 32
Stage 3: Patient injection	35	8 - 106
Total administration	75	30 - 148

Table 3. Average and range of extremity doses measured during ¹⁸F-FDG administration (Nov-07)

Average extremity dose during stage 1 and stage 3 are comparable in Aug-06 and Nov-07, which is to be expected as local practices had not changed, but there is a 64% reduction in extremity dose measured during stage 2. This translates to an overall 22% reduction in average extremity dose over the total administration and a 15% reduction in extremity dose per MBq, indicating that this reduction can be attributed principally to the design of the PET dispensary rather than the slight reduction in activity handled per patient. The range in results has decreased which is likely to be due to the increase in workload in PET and corresponding increase in experience and therefore expertise of the staff involved in PET administrations.

The use of tongs had not improved and tongs were used in only 58% of cases, as the operator either forgot to use them or choose not to use them with the thought that a reduced transfer time would minimise their radiation exposure. In this study, both left and right hands were monitored and table 4 shows the use of tongs affects the extremity dose to the right hand as this was the hand that all technologists used to transfer the syringe to the dose calibrator (there was little notable difference between the right and left hand extremity doses during stages 1 and 3).

Stage 2	No Tongs		No Tongs	
	n	Average dose (μ Sv)	n	Average dose (μ Sv)
Both hands	19	10	14	15
Left hand	8	16	5	15
Right hand	11	6	9	14

Table 4. Average extremity doses for right and left hand whilst measuring the dose (Nov-07)

DISCUSSION

Although extremity dose results are dependent upon departmental dispensing protocols, local radiation protection devices etc, it is useful to ascertain whether extremity doses at the Christie are comparable with those in other PET centres. Pant et al [5] used an EPD at wrist level to record an average extremity dose of 10.24 μ Sv per 370 MBq ¹⁸F-FDG injection and

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Cordeiro et al [6] used Monte Carlo modelling to estimate an extremity dose to the middle and index fingers of $42 \pm 5 \mu\text{Sv}$ received per 370 MBq ^{18}F -FDG injection. The average extremity dose from injection at the Christie was $35 \mu\text{Sv}$ (average activity 382 MBq) which is in reasonable agreement to simulations by Cordeiro et al, but higher than Pant et al, although the latter study measured dose at wrist level. Biran et al [7] used ring TLDs to measure an accumulated dose of $2010 \mu\text{Sv}$ for handling a total ^{18}F -FDG activity of 10725 MBq over 7 working days, giving $69.3 \pm 5.5 \mu\text{Sv}$ per 370 MBq total administration. This is similar to the Christie ($75 \mu\text{Sv}$) although ring dosimeters have the disadvantage of distance from the finger tip and the dose to the tip of the index finger has previously been shown to be up to twice that of the base of the finger, depending on dispensing technique [8].

In August 2006 assuming 10 vial installations and 30 administrations/week, 52 weeks/year with 4 technologists the estimated annual extremity dose per technologist was $43 \pm 33 \text{mSv}$. In November 2007 assuming 15 vial installations and 50 administrations/week, 52 weeks/year with 7.5 full time technologists the estimated annual extremity dose per technologist is $31 \pm 15 \text{mSv}$.

CONCLUSION

We have successfully reduced PET extremity dose at The Christie. The new PET dispensary design reduced extremity doses by 64% when measuring activity in the syringe (22% for total administration) and it has been shown that the use of tongs gives > 50% dose reduction when measuring the activity in a syringe. Dose sharing and thorough staff training have also contributed to a lower estimated annual extremity dose per technologist (31mSv in Nov-07 compared to 43mSv in Aug-06) despite an increase of more than 100% in clinical PET workload.

This estimated annual extremity dose is well below the annual extremity dose limit of 500mSv and the annual extremity dose limit for classification (150mSv) [1]. However, the principle of ALARP still applies and practical measures that can be undertaken to reduce the extremity dose should be implemented whenever possible, including continued use of syringe shields and a greater compliance in the use of tongs.

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The European Radiation Protection Authorities Network (ERPAN)

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"Networks, by definition, connect everyone to everyone. Hierarchies by definition do not; rather they create formal channels of communication and authority. Networks operate informally with few rules, they depend on trust" - Gilbert Probst

In June 2006 the first meeting of the newly created European Radiation Protection Authorities Network (ERPAN) took place at the headquarters of the Autorité de Sûreté Nucléaire (ASN) in Paris.

The purpose of this new network was to promote better communications between national regulatory authorities, particularly in relation to issues on an operational level. Through the establishment of this network it was suggested that the exchange of information, requirements and experiences on the processes of authorisation and inspection methods employed in European countries would assist in the promotion of the ALARA principle.

Recognising the work of other networks it was agreed that ERPAN would limit its focus to radiation protection issues relevant to the non-nuclear sector such as research, education, medical and industrial applications of sources of ionising radiation as well as NORM. In particular, it would provide a forum for the discussion of relevant topics such as inspection and investigation practices, ALARA, European legislation/Directives, training requirements for inspectors, authorisation processes (notification, registration, licensing), stakeholder involvement and incident management.

The network is comprised of participants with direct responsibility for the management of inspection

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programmes within regulatory authorities. It was agreed at the first meeting that there are benefits to the sharing of inspectors' experiences and it was recommended that inspectors from one country should participate as observers on inspections carried out in other countries. While the network is unable to provide financial support towards any of these opportunities it recommended that this sharing of experiences should be considered as a fundamental part of on-the-job training for inspectors and be financially resourced through the training and development budgets within individual regulatory authorities.

The network currently consists of participants from 17 regulatory authorities across 15 countries in Europe - Belgium, Czech Republic, France, Germany, Greece, Ireland, Luxemburg, Netherlands, Norway, Romania, Slovenia, Spain, Sweden, Switzerland and the United Kingdom. The participants meet at the beginning of the Summer in Paris each year to discuss and share experiences on issues such as radiological incidents and responses, the training of inspectors, stakeholder involvement and inspection protocols. For the rest of the year an email forum is used for discussions.

One of the primary aims of the Network is to facilitate members of regulatory bodies witnessing inspection activities, in their particular area of expertise, in other European countries. To date, inspection witnessing exchanges have been successfully completed between the regulatory authorities in France & Switzerland, Greece & Ireland, Belgium & Germany, Ireland & United Kingdom and Ireland & Luxembourg. The lessons learned and practices witnessed in other countries can then be fed back into national inspection programmes. The network has also facilitated several meetings and training opportunities between regulatory authorities.

Throughout the year the participants use an email forum to discuss issues and survey regulatory positions across Europe. Examples of the types of issues discussed by the network include the implementation of the HASS Directive, licensing requirements for dental radiography, experiences with the regulation of cyberknife and best practice for source deliveries in nuclear medicine departments.

After two and half years of operation the network can be considered a success. Despite not have any financial support it continues to work well and is meeting the objectives agreed at its inaugural meeting in 2006. Some of the reasons suggested by the participants as to its success include the fact that it operates in an unofficial and straightforward way and is comprised of individuals working at comparable levels in similar organisations. On regular occasions it has shown itself to be a fast and reliable way to survey regulatory positions across Europe.

The importance of bringing all the participants together

once a year for face to face discussions cannot be over emphasised and without doubt helps to strengthen the links that make up the network. The generosity of the ASN in hosting these annual meetings is greatly appreciated by all of the network participants.

The network is always open for new members from regulatory authorities within Europe. Further information may be obtained by contacting one of the authors.

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Summary of the 1st ARAN Workshop "Improving Radiation Protection in Industrial Radiography"

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The ALARA Network for the Asia and Pacific Region (ARAN) was established in 2007 at a regional meeting held in the Republic of Korea. This second meeting of the network had the objective of sharing and exchanging experiences in controlling occupational radiation exposure in industrial radiography practices.

There were 28 participants from RCA* Member States. The meeting was held at NIRS, Chiba, Japan. All the participants had sound experience in radiation protection in industrial radiography practices. The meeting was structured in several sessions with presentations from experts and country presentations. The sessions covered topics such as Accidents/Incidents in industrial radiography and lessons learned, Regulatory requirements for radiation protection in industrial radiography, Techniques and equipment used in industrial radiography and new developments, Occupational exposure trends in industrial radiography, and Training programmes in industrial radiography to improve radiation protection. The participants discussed specific issues in industrial radiography practice in working groups. This was the most useful part of the meeting.

The general conclusion was that the meeting was a good opportunity for participants to benchmark the radiation protection status in industrial radiography practice. ARAN was welcomed as a good project which should

* RCA (the Regional Co-operative Agreement): an intergovernmental agreement for East Asia & Pacific region, under the auspices of the IAEA, in which the Government Parties undertake, in co-operation with each other and with the IAEA to promote and co-ordinate co-operative research, development and training projects in nuclear science and technology through their appropriate national institutions. The RCA Member States include the following 17 countries; Australia, Bangladesh, People's Republic of China, India, Indonesia Republic of Korea, Japan, Malaysia, Mongolia, Myanmar, New Zealand, Pakistan, Philippines, Singapore, Sri Lanka, Thailand and Vietnam.

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have happened a long time ago. It was concluded that there is a need for improving the safety culture in the industrial radiography sector in different ways; harmonizing training or sensitization at the regional and national level, organizing dialogue between the concerned stakeholders, improving inspections and favouring feedback exchanges.

Therefore in order to improve the safety culture in the industry several recommendations were made:

Recommendation 1: Codes of Conduct for Industrial Radiography Practice

It is recommended to the national regulatory bodies to prepare codes of conduct for the NDT companies and their clients. These codes should be elaborated, in close relationship with the national NDT associations or societies, and where possible the major clients and be aimed at the NDT managers to encourage them to enhance the safety culture in the industry

It is recommended to ARAN to promote harmonisation of these codes at a regional level.

The IAEA has developed training for Radiation Protection Officers and also for Qualified Experts in this sector, but not for the industrial radiographers. Training of these key personnel is important.

Recommendation 2: IAEA Training Material for Industrial Radiographers

The IAEA should develop training standards and courses for industrial radiographers to complete the package from Qualified Expert and Radiation Protection Officer to Qualified Operator.

To complement recommendation 2 it is suggested that:

Recommendation 3: ARAN Survey on Industrial Radiography Safety Training

ARAN perform a survey of all training requirements and existing materials and syllabus as well as awareness programmes in the region and to set up a working group to analyse the survey results and to provide feedback on best practices in training to the national regulatory bodies and NDT associations.

In order to reduce the number of violations, there is a need to improve the consistency and efficiency of inspections and controls. Feedback experience from some countries shows that unannounced inspections are much more efficient. Therefore:

Recommendation 4: Unannounced Inspections of Industrial Radiography Site Work

It is suggested to all regulatory bodies to perform preferably unannounced inspections as frequently as possible and ensure the implementation of appropriate corrective actions. To help improve the quality and

consistency of inspections, Regulatory bodies should use the IAEA TECDOC 1526 and should implement systems for certification and accreditation of inspectors.

ARAN should promote sharing of information on programmes and practices for inspections as well joint inspections where possible.

Recommendation 5: Notification of Industrial Radiography Site Work

A system of notification for site radiography is recommended as good practice. Each country should consider how they may implement this. For example it may be necessary to have the option to provide fast track notification and approval routes. A compromise may be a transport notification system only.

There needs to be more trust and confidence between Regulators and Industrial Radiography Companies.

Recommendation 6: Dialogue between Regulatory Body and NDT Companies

It is recommended to the national regulatory bodies to improve communication with the NDT industry through a range of methods including seminars, workshops, user-friendly guidance publications, etc. The primary aim of the communication strategy is to help encourage openness and feedback between users and regulators to help improve the safety culture. Such communication may lead to the establishment of performance safety indicators adapted to industrial radiography.

Recommendation 7: Feedback Experience from Industrial Radiography Incidents

It is recommended to ARAN to set up a procedure for collecting feedback, on incidents, accidents and near misses from the participating countries in a standard format. This information should be in English and anonymous. It is requested from ARAN, after a review, to make that material available to all ARAN members through adequate channels such as a specific chapter on the web site or through publications.

There is a need to avoid using radiography equipment that is too old or badly maintained. Therefore as far as the equipment is concerned:

Recommendation 8: Industrial Radiography Equipment Certification

Regulatory authorities need to check validity of certification for gamma radiography equipment in use in their country. This could be done prior to licensing and/or prior to issuing import consent. In addition regular checks during compliance monitoring and checks against the IAEA Directory of National Competent Authority package design certificates when revised should be carried out.

Recommendation 9: Industrial Radiography Equipment Maintenance

The servicing and maintenance of radiography equipment should be carried out only by firms certified and authorized by the Regulatory Body and by personnel trained by the manufacturer.

Recommendation 10: Periodic Assessment of Industrial Radiography Equipment

It is recommended to the management of the NDT companies to reinforce the periodic assessment of the performance of their equipment and to provide the regulatory bodies with proof of these assessments and the results of the assessments when requested

As this is a critical area that requires more work, ARAN should consider forming a Working Group to develop guidance on the requirements for periodic maintenance including specific information for different types of industrial radiography equipment in use in the region. In addition the Working Group should provide guidance on how the competence of maintenance personnel can be assessed and make recommendations on an accreditation process for maintenance personnel.

Finally the NDT firms should be able to check their radiological protection performances and to benchmark with the others both at national and international levels. Therefore:

Recommendation 11: National Dose Database Harmonisation and Availability

In order to favour benchmarking at the level of the NDT firms, the regulatory bodies should make available for each NDT company the national statistics concerning dose distributions in industrial radiography. To facilitate international benchmarking ARAN should consider the harmonisation of the format for such data.

4th RECAN Workshop on “Problems in the industrial application of ionizing radiation sources” Risan, Montenegro, November 2008

The 4th workshop of the Regional East European and Central Asian Countries ALARA Network (RECAN) was held in Risan, Montenegro, on 17-19 November 2008. Hosted by the Government of Montenegro and organized by the Center for Toxicological Research with the support of IAEA, it was attended by 46 participants coming from 28 countries. The high number of attending countries should be noted, showing that the interest for the RECAN workshops is increasing, in particular when topics directly connected with practices are addressed.

In the first session on “Setting the Scene”, the missions of the IAEA related to networking were presented and as well as the place of such workshop in the global

system the Agency has developed in order to implement its safety standards. As requested by the RECAN Steering Committee, the presentation gave also a short summary about the categorization of radioactive sources as well as about the International Nuclear Event Scale, both of these topics being mainly focused on their relevancy with the topic of the workshop.

The main features of RECAN were then presented by M. Novaković who stressed on the added value of networking and, in particular, what was already achieved through RECAN and its “products” such as the previous workshops, the Newsletter and the website.

Presentations were then given on “Activities of the European Federation for Non Destructive Testing (B.Redmer, invited expert, Germany), “Worker protection in NDT applications” (B.Redmer), “Overview of applications of industrial radiation sources” (F.Ylli, Albania), “Protection of workers operating industrial irradiators” (L.Rosdylouskaya, invited expert, Belarus), “Experience from recovery operations for radioactive sources” (G.Nabakhtiani, Georgia), “Worker protection in the use of X-ray machines for security screening (P.Demetriades, Cyprus) .

J. van der Steen (external expert representing the EUTERP) introduced the tasks expected to be performed during the session in working groups. He recalled the main expectations of such session and provided details on the questions to be addressed by the groups, these questions having been defined by the RECAN Steering Committee during its May 2008 meeting at VIC.

On the second day, presentations were given on “Licensing and inspection” (A. Kim, Kazakhstan), “Optimization of worker protection in safe use of industrial sources” (R. Paci, Albania), “Registration; inventory; tracking of sources” (Lidija Nikolovska, FR of Macedonia), “Databases for incidents with industrial radiation sources” (P. Crouail, France), “Case study of an incident with an industrial radiation source” (A.Hustuc, Republic of Moldova), “Illicit trafficking / orphan sources” (S. Mancas, Romania), “Safe storage and disposal of disused and spent sources” (I. Gabulov, Azerbaijan). In the afternoon, the working groups completed their work, and at the end of the day, each rapporteur provided a summary of the findings of the working group as well as proposals for general recommendations. The recommendations which have been agreed on are listed hereunder.

Recommendation 1: Regulatory infrastructures

In order to improve the occupational radiation protection from a regulatory perspective it is recommended that Regulatory Authorities:

- Undertake a self-assessment and a critical review of work,

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- Promote inter-regulatory authority exchange visits and meetings with counterparts, with emphasis on licensing, inspections, enforcement and issues of common concern (best practice) (ref ERPAN).

Recommendation 2: Self-assessment

It is recommended that the IAEA considers the preparation of guidance on self-assessment, specifically for the application of industrial radiation sources.

It is recommended that RECAN provides a forum for experience exchange concerning Self-Assessment implementation in the future.

Recommendation 3: Inspection

It is recommended that the IAEA continue to facilitate the participation of inspectors as observers in real inspections of facilities.

Another possibility is to arrange a workshop in a specific country which can provide on-site inspections.

Recommendation 4: Quality Management

It is recommended that Regulatory Authorities implement a Quality Management System particularly for licensing, inspection and enforcement activities with regard to the control of radiation sources.

It is also recommended that Regulatory Authorities promote, as part of the operator's quality management system, the development of a safety culture for the control of radiation sources.

Recommendation 5: Education and training

The Workshop acknowledged the progress that has been made by the EUTERP Platform in establishing standards for training, qualifications and requirements for RP professionals and radiation workers:

- It is recommended that international organisations such as IAEA, European Commission, IRPA and professional organisations such as EFNDT continue to promote the harmonization of training requirements for RPOs and radiation workers, particularly in the field of industrial radioactive sources,
- It is also recommended that Regulatory Authorities create a basic infrastructure for training in compliance with these harmonized requirements.

Recommendation 6: Assessment of capacity needs

It is recommended that the IAEA should make an analysis, based on the inventory of sources and facilities of Member States, to assess gaps in the staffing of radiation protection professionals which are needed in order to comply with the BSS. This will help in assessing the manpower and training needs in the future.

Recommendation 7: Good and bad practices

It is recommended that the IAEA continues to promote and coordinate the development of systems allowing the dissemination of lessons learned from incidents and accidents among all stakeholders, including manufacturers of industrial radiation sources.

It is recommended that Regulatory Authorities, in cooperation with professional organizations, initiate and promote the development and dissemination of documents on good practices (e.g. codes of practice) and the use of methods and tools to achieve ALARA.

Recommendation 8: Control of sources

It is recommended that the IAEA develops guidance for countries to harmonize the procedures at the borders in order to facilitate the control of sources

It is recommended that the IAEA develops guidance in order to help countries to harmonize national registers as required by the Code of Conduct (Art.11).

It is recommended that Regulatory Authorities take into account emergency situations related to orphan sources and to establish a national emergency plan including, if appropriate, the establishment of a special team for responding in such cases

CONCLUSION

Without any doubt, the workshop led to many discussions between representatives of the participating countries. Similar problems were identified, common solutions were proposed in order to reach a more homogeneous and efficient level of radiation protection in the countries.

It's also worthwhile to indicate that the majority of the participants are daily in charge of the regulations - or the practices- involving the use of ionizing radiations in industrial areas. The feedback from the participants - in particular from three attendees not belonging to the RECAN countries - was very positive and contacts between participating countries were established which should foster further cooperation between them, ensuring the RECAN sustainability on a long term.

The fifth RECAN workshop will be organized in Almaty, Kazakhstan (23-25 September 2009) and will address "Optimization and Technical Services Organizations".

View of the project "European ALARA Network for Naturally Occurring Radioactive Material - NORM" and its future (Dec. 2006 - Dec. 2008)

H. Schulz, E. Ettenhuber, K. Flesh, L. Geldner,
R. Gellerman

The EC EAN_{NORM} project was undertaken by a consortium consisting of IAF - Radioökologie GmbH (Dresden), Hydrogeologie GmbH (Magdeburg) and Robotron Datenbank-Software GmbH (Dresden). The contractor had to perform the following tasks:

- Establishing an office infrastructure for the execution of all work related to the creation and the operation of the EAN_{NORM},
- Identification of contact points and stakeholders,
- Developing a methodology for the creation of the EAN_{NORM},
- Operational start of the network,
- Preparation of the integration of the EAN_{NORM} into EAN.

Furthermore, a workshop had to be organised to provide an opportunity for all experts and the interested public to discuss the future regulation of NORM prepared by the European Commission and the role of the EAN_{NORM} in the discussion process.

In order to interconnect the participants and to provide an effective operational system for the data and information exchange, the contractor developed a computer-based online platform. It can be found at the Internet address www.ean-norm.net or www.ean-norm.eu. Via this platform, the cooperating partners can easily establish contacts to other network partners from the national authorities, the industry, national and international association and the EC. Furthermore, the network partners can exchange their experience, discuss the problems arising in the practice or other issues of relevance, recommend to interested partners practical approaches and operational measures aimed to reduce the radiation doses of workers. The Final Report [1] of the project deals with the following issues:

- Establishing an office infrastructure for the execution of all work related to the creation and the operation of EAN_{NORM},
- Identification of contact points and stakeholders in the radiation protection field in the relevant industries, international and national associations or bodies representing specific industry sectors, as well as international organisation and national and international radiation protection associations,
- Methodology for the creation of EAN_{NORM} (describing the network architecture aimed at interconnecting the participants and proposing an operational system for the data and information exchange),
- Start of the network and first network operations,
- Survey of the industrial activities with NORM in the Member States,

- Survey of the regulations on radiation protection of workers in the NORM industry and the radiation protection practice,
- Proposals to the European Commission and problems to be solved.

In January 2009, 59 persons are registered as experts (contact points). The mailing list of the registered contact points and further information on the contact points e.g. profession, field of activities, professional experience, can directly be taken from the contact data base of the internet platform. Altogether (January 2008), there are 105 persons registered as a member of the EAN_{NORM}.

The platform can be used to disseminate information about the current national and European regulations concerning radiation protection and about the regulatory initiatives or administrative procedures in the Member States of the European Community. Using the discussion forum integrated in the platform, the network partners can also directly participate in the development and maintenance of further regulations and of the Code of Practice for radiation protection in the NORM industry and in other work activities.

The Web Portal was started on Monday, 23 April 2007. Up to October 2008, more than 25,000 users (*successful requests for pages*) visited the website, and approximately 50 users per day are visiting the Web Portal of the EAN_{NORM}. The network has not yet become self-sustainable. This is a longer process that will take some years and still needs considerable managing, promoting and financing.

The project arrived at a number of recommendations which shall be useful for a further promotion and use of the EAN_{NORM}:

- The introduction of clear and precise requirements for NORM industries in the revised European BSS is welcomed by the NORM community. However, the regulatory system should allow for a graded approach and maintain some flexibility,
- The industries of concern in the Member States are the same listed in IAEA Safety Report No. 49, in Radiation Protection No. 135 and in other documents. Therefore, these industries and work activities should be specified in the "positive list" intended in the future BSS,
- In the revised BSS, the EC should consider the inclusion of on management and disposal of waste originating from the listed NORM industries,
- There is limited knowledge of radioactivity in NORM materials in several industries. EAN_{NORM} will support the dissemination of information about the radioactivity in the materials for all industries listed in the BSS. The EAN_{NORM} webpage should also provide information on the risk to the public, in order to avoid unnecessary anxieties,
- The components of the web site (questionnaires, discussion forum) are definitely very effective tools,

but their applications are not self-sustainable, and they have to be maintained. The EC should engage in the discussions on the web site,

- The NORM community would be very interested, and contribute, if appropriate, to the drafting of new requirements for NORM industries. The EC should use the network and the advantages of the web site for it,
- The EAN_{NORM} will develop a list of topics for the discussion forum on the web site and ask the contact points to provide technical papers. Taking into account the results of the questionnaires and the discussions during and after the workshop, the following issues are of general interest:
 - Measuring techniques for the relevant natural radionuclides in the materials,
 - The approach to assess the exposure of workers, and
 - Monitoring of radiation protection measures and the effectiveness of countermeasures.
- To monitor the exposure of workers, several measurements can be applied. The measurements of the local gamma dose rate are the most frequently performed. However, in numerous cases, individual dose meters are also used. The requirement of radon measurements for monitoring (more than 20% of the responders to the questionnaire have mentioned it) is surprising. So far, the systematic radon monitoring of workers in NORM industries is practiced rarely. The EC should initiate the development and publication of guidelines for optimised monitoring programmes in NORM industries e.g. monitoring exposures of workers,
- Additional documents should be implemented in the web site for downloading. In addition information on publications, meetings, etc. are desirable,
- To further promote the development of the network and the harmonisation of radiation protection within the NORM industries, the EAN_{NORM} proposes to organise a second workshop thematically following the first "European ALARA Network for NORM" workshop in Dresden in 2009.

The EC project of developing the EAN_{NORM} was a two-year project that ended in December 2008. One of the objectives of the project was to either prepare implementation of the EAN_{NORM} network into an existing EAN or, if it appeared advantageous to keep the NORM network separated, to prepare its self sustainability. Achieving self-sustainability, however, is a longer process that will take some years and still needs considerable managing, promoting and financing. There are several problems which have to be solved in the near future in order to keep the network alive and running. At present, the network is still managed by the leader of the consortium. The ownership structure of the web site has to be clarified in the near future. The scientific management of the network has to be seamlessly continued after the end of the contract. Therefore, several alternatives are currently discussed, whereby the possibilities for alternative financing to ensure

sustainability of the network are explored.

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Radiological Incidents during Treatment of Breast Cancer in the Czech Republic

J. Kropacek (SONS, Czech Republic)

Radiotherapy treatment in the Czech Republic is centralized into 25 centres that are equipped with 34 linacs and 11 cobalt units.

On 8th and 9th June 2006 the State Office for Nuclear Safety (hereafter SONS) learned from media reports that an unplanned dose was given to a patient with breast cancer.

The patient having a tumour on the right side went through surgery in August 2005 and chemotherapy followed. The patient was referred (by the prescriber) to the Radiotherapy centre with all relevant medical records. The medical practitioner responsible for planning of the strategy of the treatment mistakenly identified the left breast as a target. All the following procedures (localization, planning and simulation) were given on the left side. On 19th January 2006 the treatment plan was approved by a senior radiotherapist without giving the patient a physical check up. Between 19th January and 6th March 2006 the patient received the dose of 48 Gy (2Gy per fraction) to the target volume.

During the radiotherapy treatment the patient brought to attention of the personnel a post-radiation skin reaction on the left side of the neck and shoulder, but the personnel gave no response. The wrong procedure was discovered by the prescriber only during the first session after the treatment. The irradiation of the patient was unjustified and she had to be followed up. The report about the incident was completed by the Radiotherapy centre but the SONS was not informed at that time.

Since this event another four events have occurred in different radiotherapy centres throughout the Czech Republic. In one case the mistake was discovered after the fifth fraction.

SONS performed inspections in these facilities immediately after being informed. The action taken against the licensees took into account whether the radiological event was reported to the Regulatory Body (SONS) without delay or not. The aim of this approach is to discourage the licensee from concealing this type

of information in the future. A letter from the deputy of SONS requiring information about measures preventing this type of event was distributed to all radiotherapy centres.

All licensees are obliged to have a QA/QC programme for the use of sources of ionising radiation in which a double-check of the treatment plan is strictly required as a standard procedure. However, the double-check of the treatment plan is mainly focused on the quality of the plan from the dose distribution point of view, the QA/QC programmes have to be not only precisely described but carefully applied during each step of the treatment.

Furthermore, communication between medical staff and patients should be implemented in QA/QC programme and as a part of good practice; it is the last chance to avoid such a mistake.

ALARA NEWS

☐ Reinforcement of the inspection programme in radiotherapy centres in France

Several accidents, incidents or anomalies affected radiotherapy centres in medical facilities. ASN has decided to encourage radiotherapy professionals to define tools with a view, not only to prevent incidents and accidents in radiotherapy centres, but also to strengthen safety in therapeutic applications.

Since the 1st July, ASN publishes on its website (www.asn.fr) the letters sent to licensees after inspections in radiotherapy centres (follow-up letters). This process of publication, already applied to basic nuclear installations since 2002, will be extended to all small-scale nuclear activities.

During the first half of 2008, several centres combining inadequate staffing and organization have been inspected a second time by ASN. The follow-up letters concerning this new set of inspections have been sent to regional agencies of hospitalization (ARH) and handed over to the support group set up by the National Cancer Institute (INCa) at the request of the Minister for Health, the Youth, Sports and Associations. This group, to which ASN participated, identified nine centres for which the Minister for Health has requested the implementation of immediate actions to remedy physician staffing deficiencies.

☐ Radiation Protection Adviser for dental practices in Ireland

In accordance with the requirements of S.I. No. 125 of 2000, which implements Council Directive 96/29/Euratom in Irish legislation, all Irish dental practices are now required to appoint a Radiation Protection Adviser (RPA) [Qualified Expert] to their practice. Each dental practice must arrange for their appointed RPA to undertake a review of their facility to ensure that it provides appropriate levels of protection for workers and members of the public. In addition, each practice must ensure that all X-ray units have undergone an RPA Quality Assurance assessment within the past two years.

☐ Radiological Protection Forums in Spain

CSN has created a Radiological Protection Forum in the medical field with the Radiological Protection and Health Physic Associations since 2001. Currently CSN has established two new Forums with the Radiological Protection Association: one in the industrial field and the other with Radiological Protection Units (UTPR). This UTPR carry out radiological protection and adviser activities in the installations.

The Forums aim to encourage dialogue in order to improve safety and radiological protection. The Forums work through Forum Committee and ad-hoc working

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group. The work matters are chosen by Forum Committee and they are of interest of both parts (CSN and Associations).

❑ The CANUPIS study (Childhood Cancer and Nuclear Power Plants in Switzerland)

For the first time, a nationwide study has started on the 1st of September 2008 in Switzerland to examine the question if residence close to a nuclear power plant is associated with an increased risk of childhood cancer (CANUPIS study). Switzerland has five nuclear power plants (Beznau I und II, Mühleberg, Gösgen und Leibstadt), which generate about 40% of the electricity in Switzerland. About 1% of the Swiss population of 7.5 million lives within 5 km of a nuclear power plant and approximately 10% live within 15 km. The CANUPIS study aims to determine if children who grow up near nuclear power plants have an increased risk to develop childhood cancer and particularly leukaemia. The study will also examine the influence of other factors including electromagnetic fields or industrial emissions. The CANUPIS study was jointly commissioned by the Swiss Cancer League and the Swiss Federal Office of Public Health. Data collection and analysis will take approximately two and a half years and results can be expected to be published in 2011. They will be evaluated by independent experts, published in a scientific journal and presented to the public. Complementary information can be found on www.canupis.ch.

❑ Health Protection Agency (UK) response to the ICRP 2007 Recommendations

In August 2008, HPA published its formal response to the ICRP 2007 Recommendations. This was issued for comment, and included 25 specific questions that stakeholders were invited to address. The consultation process closed on 14 November. There are a number of areas where HPA has recommended some divergence from ICRP's recommendations. Perhaps the most significant issue is the recommendation of a public dose constraint of 0.15 mSv/y for new nuclear power stations, and a question of whether this should be extended to all new sources. Full details of the HPA response can be found at: http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1205741916373

❑ 3rd Workshop of the EUTERP Platform

The 3rd Workshop of the EUTERP Platform on "Competences, roles and duties of the Radiation Protection Expert (RPE) and Radiation Protection Officer (RPO) as a basis Education and Training and (Mutual) Recognition" will be held in Antalya (Turkey) from 16th to 18th April 2009. It will be dedicated to the progress that has been made on the follow-up and implementation of the recommendations made at the 2nd Workshop (Vilnius, 2007), other than the definitions of RPE and RPO. More information on the EUTERP website: www.euterp.eu.

❑ 12th European ALARA Network Workshop

The 12th EAN Workshop will deal with "ALARA issues arising for Safety and Security of Radiation Sources and Security Screening Devices". It will be held in Vienna (Austria) from 21st to 23rd October 2009. The aim of the workshop will be to consider how the implementation of ALARA, in terms of planned and emergency exposure situations, involving worker and public doses, is affected by the introduction of these new security-related measures. In the case of new equipment and procedures, there is also the question of whether exposures arising from security screening devices can be justified. In addressing these issues, the workshop aims to consider how an optimum balance between protection, safety and security can be achieved. Pre-registration are opened until May 31, 2009. More information can be found on the workshop's website: www.alara2009.at.

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