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Editorial

In February 2008 the revised ICRP Recommendations for a System of Radiological Protection (Publication n° 103) were published, formally replacing the Commission's previous, 1990, Recommendations (see ALARA Newsletter No. 21). They reinforce the principle of optimisation of protection, which should be applicable in a similar way to all exposure situations, subject to restrictions on individual doses and risks: dose and risk constraints for planned exposure situations, and reference levels for emergency and existing exposure situations.

Contents of Issue #23

In that context, the present issue of the ALARA Newsletter illustrates how wide the scope of the optimisation of radiological protection is today. The 11th EAN Workshop on "ALARA in radioactive waste management" in Athens showed that the implementation of the ALARA principle was a common and crucial factor in the nuclear fuel cycle, medical, NORM, industrial, educational and research sectors. In addition, numerous recent incidents and accidents in the medical sector, in particular in radiotherapy, lead to a reinforcement of the control of medical activities by Radiation Protection and Safety Authorities all over Europe. Most of the surveys and inspections made in the medical sector demonstrate that exposures received both by patients and workers could be reduced and optimised through improvements and changes in day-to-day practices, the use and mastery of modern equipments, and the intensification of the training of professionals. The article on "patient doses from dental radiography in the UK" published in the present Newsletter is a very good example of the extent of the problem and the benefits that could be gained by a rigorous implementation of the ALARA principle. The industrial sector, not to be outdone, continues to be affected by radiation incidents that show that vigilance towards radiation protection should be everyone's business and concern - see hereafter the incident of a melting source in Italy and the implementation of the HASS Directive in the same country as a response to prevent radiological accidents in the industrial sector. The dissemination and extension of radiological protection networking is a recent and promising solution to improve the development of a practical radiological culture all over the world (see Lefaure's paper), through public and professionals channels.

To conclude, until scientific research provides unequivocal answers about the radiation effects at low doses and/or low dose rates (see Mundigl's paper as an example for tritium), the optimisation of radiological protection will remain the only responsible approach to managing radiation exposures.

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EAN 11th Workshop "ALARA in Radioactive Waste Management" Conclusions and Recommendations

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WORKSHOP OBJECTIVES AND PROGRAMME

The aim of the 11th EAN Workshop was to discuss the implementation of the ALARA principle with regard to occupational and public exposures arising from the management of radioactive waste. This includes waste from the nuclear fuel cycle, medical, NORM, industrial, educational and research sectors. There were 62 participants from 15 different European countries representing these different sectors. In addressing radioactive waste management, the workshop aimed to consider topics such as re-use and recycling, interim and decay storage, clearance levels and discharges to the environment, as well as final disposal to a repository.

As with previous workshops, half the programme time was devoted to presentations, and half to Working Group discussions and their findings. Participants had the opportunity to consider the findings of each WG, contribute to discussions, and formulate the final recommendations of the Workshop.

In total, there were 20 oral presentations, arranged under the following sessions:

- Introduction and setting the scene;
- Stakeholder involvement and decision-making;
- Application of the ALARA principle;
- Practical experience from the non-nuclear sectors; and
- Practical experience from the nuclear sector.

Two afternoon sessions were set aside for Working Group discussions, based on the following topic areas:

- Dealing with doses – how to take account of different dose distributions, worker and public doses, doses over long timescales, etc?
- How should ALARA be applied and implemented in the areas of re-use and recycling of radioactive residues?
- How should ALARA be applied and implemented in the area of disposal of radioactive waste?
- Should different strategies be applied to the different sectors and what should these differences be?
- What are the main criteria that should be used for decision-making in the management of radioactive waste?

The reports from the groups were presented and discussed on the final day, and are the basis for the findings and recommendations from the workshop.

A number of significant themes and issues emerged, and these are described below. The individual presentations (papers and slides) are available to download from the EAN website (http://www.eu-alara.net/).

THEMES AND ISSUES ARISING

The introductory session considered the international and national approaches to radioactive waste management (RWM). In terms of the former, we have new ICRP recommendations (Publication 103), the impacts of which are still being considered in the current revisions to the EU and IAEA Basic Safety Standards. In terms of RWM, all three of the new ICRP exposure situations (planned, existing and emergency) are relevant, and indeed may apply sequentially over the extended period of time envisaged for certain disposal operations.

It is widely agreed that radioactive waste has to be considered an integral part of a practice when applying the principles of justification and optimisation. However, it was clear from the workshop that significant quantities of waste from historical sources already exist, and that these have to be safely managed now and in the future. Furthermore, there is an obligation on National Authorities to provide the necessary strategies and facilities to effectively manage waste from both historical and ongoing (justified) operations. It also needs to be ensured, especially in relation to NORM waste, that there is effective communication and co-operation between waste producers and waste recipients, and the regulatory authorities.

Stakeholder involvement has been a theme in many previous Workshops, and it would seem to be especially relevant to RWM. The theme has clearly continued to develop, and in this workshop a number of examples of Public and Stakeholder Engagement (PSE) were presented. A number of issues emerged, including:

- The objectives and scope of such engagements need to be clearly defined and understood by the different stakeholders;
- It is better to provide stakeholders with options to consider, rather than decisions to accept;
- Involvement and engagement do not (and should not) be expected to automatically produce agreement or even acceptance. Nor do such exercises simplify the decision-making process; and
- Workers are key stakeholders, often likely to receive much higher doses than the public, and need to also be involved.

The third session dealt with the application of the ALARA principle to the RWM process. This, and the subsequent working group discussions, demonstrated that the interface between ALARA and RWM is complicated, and it is not always clear how it should be applied to issues such as re-use and recycling, decontamination and clearance, liquid and gaseous discharges, and the disposal of solid waste in repositories. The situation is further complicated by the existence of other waste management principles such as Best Available Technique, and Best Practical Means. There is still only limited consensus on reference levels, for example in terms of activity concentrations for

clearance purposes, and the focus on complying with numerical values can often distract from the overall requirement to optimise.

The third session also highlighted the difficulties associated with considering collective doses, especially where individual doses are low. As highlighted in the 10th EAN Workshop, there has been a progressive move away from quantitative techniques such as cost-benefit analysis, and ICRP now recommend a judgemental approach to the issue. The commission does indicate that less weight should be given to very low doses, but there is no detailed guidance. In practice, this has left something of a vacuum in the decision-making process, especially for those RWM operations that involve very substantial investment.

The last two sessions provided an interesting comparison between the nuclear fuel cycle and other sectors. For the latter, discharges to the environment are a key issue, especially for medical and research applications using unsealed radioactive materials. Doses to the public have often been assessed by models, which have tended to overestimate doses. More detailed studies involving environmental measurements and sampling are required in order to estimate doses with sufficient accuracy for optimisation purposes. Even then, the impression is that disposal is governed by the options available, rather than what is best.

In the nuclear sector, ALARA culture and procedures are much more mature, and good examples of optimisation of worker doses in RWM operations were presented. These highlighted that a range of protection options can be effective and other sectors can usefully learn from this experience. Despite the growing acknowledgement that sectors such as NORM do have substantial RWM issues, the nuclear sector still has unrivalled technical and societal problems to resolve in this area. These are too complex to be resolved at this workshop – however, one message to emerge was the importance of considering the process of RWM in its totality - waste exists, and no RWM option is without hazards and risks. Rather, it is better to remind ourselves that waste management involves the safe stewardship of radioactivity, which is surely consistent with the ALARA principle.

WORKSHOP CONCLUSIONS AND RECOMMENDATIONS

Each working group produced conclusions and recommendations, and presented these to participants on the final day of the workshop. The output of the Working Groups was collated by the EAN co-ordinators, who formulated the recommendations as listed below.

Recommendation 1. International guidance on ALARA in radioactive waste management (RWM)

Although optimisation is seen as a key requirement in RWM, how the ALARA principle should be applied to different stages of the RWM process is often unclear. It is recommended that international bodies (EC, IAEA and NEA) produce guidance to help clarify the interface between the ALARA principle and the various waste management concepts and processes, in particular:

- Re-use and recycling;
- Dilute and disperse versus concentrate and contain;
- Waste treatment and disposal;
- Deriving and using generic and specific clearance levels;
- Other waste management principles such as Best Available Technique and Best Practicable Means.

The exchange of practical experience in the field of RWM is especially valuable – it helps clarify how principles are implemented in practice, and can save considerable time and effort. It is recommended that international guidance should also include practical examples and experience of the application of ALARA to radioactive waste management. In particular, examples of the following are required:

- Re-use and recycling of waste from different sectors;
- The management of hospital waste;
- The management of NORM waste;
- Deriving and using specific clearance levels.

EAN and other networks, such as RECAN, are dedicated to the exchange of practical experience, and international bodies should utilise such networks to facilitate the collection of practical RWM examples.

Recommendation 2. Harmonisation issues

There is a balance between adopting an internationally harmonised approach, and retaining national flexibility for dealing with local issues. The workshop identified that different approaches and requirements should at least aim to be coherent, and the following specific recommendations were made:

- The EC is currently reviewing the difference between their generic clearance levels and those of the IAEA. It is accepted that national authorities may wish to derive specific clearance levels above the recommended generic values; however it is recommended (to national authorities) that the process for establishing such levels is transparent, and that any differences between generic international levels and specific national levels are clearly explained. The practical implications associated with different clearance levels should also be understood. For example, national regulations may need to include statements about cross-border transport, as well as any restrictions on re-using or recycling materials from other countries that have a different approach toward clearance.

- It is noted that some terms are used with different meanings, for example ‘disposal’ sometimes is understood to include discharges to the environment, sometimes it is not; ‘nuclear facility’ sometimes refers to a nuclear power plant and sometimes to nuclear fuel cycle facilities or even a facility

involving any radioactive material. It is recommended that international organisations, including the EAN, promote the use of a standardised vocabulary.

Recommendation 3. ALARA and non-nuclear waste management

The use of conservative models to assess the impact of discharges from research and medical establishments can overestimate doses to members of the public. It is recommended that Research Institutes (and Technical Support Organisations of National Authorities, as appropriate) conduct studies to acquire more realistic models and data, and that international bodies (EC, IAEA) aim to sponsor or support this work, where possible.

These studies should involve suitable monitoring, sampling and analysis so as to better establish the transfer of radionuclides through the environment, and the collection of realistic habit data to help estimate the resulting doses to persons from different exposure pathways.

Recommendation 4. The "broader approach"

To help clarify the decision-making process, it is useful to assess the totality of the waste management process – including operations such as recycling, transport, storage, treatment, and disposal/release. This should ideally include a consideration of radiological and non-radiological risks, and should consider the inter-dependencies between the different parts of the process. Large operators should be encouraged to undertake such an assessment themselves. However, in many circumstances, National Authorities may need to take a lead and co-ordinate contributions from smaller operators, waste collection sites, etc.

Recommendation 5. Stakeholder involvement

It has been underlined during the Workshop how important stakeholder engagement is in the setting-up of radioactive waste management strategies. In particular, it has been shown that stakeholder involvement is an integral part of the ALARA process for radioactive waste management.

It is recommended that international organizations (EC, IAEA, NEA, etc.) and EAN encourage and organise the exchange of national experiences on stakeholder engagement in the consideration of radioactive waste management options, for example through seminars or the establishment of case study documents.

Some work has already been carried out on this subject. For example, a group of radiation protection professionals from the French, Spanish and UK IRPA Associate Societies organized several workshops to share information on how stakeholder engagement has been carried out in different fields. This group has produced a draft document on "Guiding principles for radiation protection professionals on stakeholder engagement". This proposal will be submitted to all IRPA Associate Societies during Summer 2008. It is recommended that the national IRPA Associate Societies carefully examine this document from a radioactive waste management perspective.

High activity sources (HASS) in Italy and the implementation of the EU Directive

S. De Crescenzo, A. Anversa, G. Bertani (Public Health Department, Lombardia District, Italy)

INTRODUCTION

One of the main purposes of Council Directive 2003/122/Euratom (Directive on the Control of High Activity Sealed Radioactive Sources and Orphan Sources (HASS)) is the prevention of exposure of workers and public to ionizing radiation arising from the inadequate control of high activity sealed radioactive sources.

According to the International Atomic Energy Agency (IAEA)[1], in 1944-2000, 420 radiation accidents led to significant overexposure of at least one person: about half of all radiation accidents were observed in industrial facilities (Figure 1). In most cases, these accidents involved one or only a few persons: a relevant fraction of these accidents was due to "*orphan sources*". ^{192}Ir sources, used primarily in radiography to check the quality of welding, caused almost half of all radiological accidents; ^{60}Co, which is the most common source of irradiators for radiotherapy and sterilization or food preservation, is responsible for over one quarter of all radiological accidents.

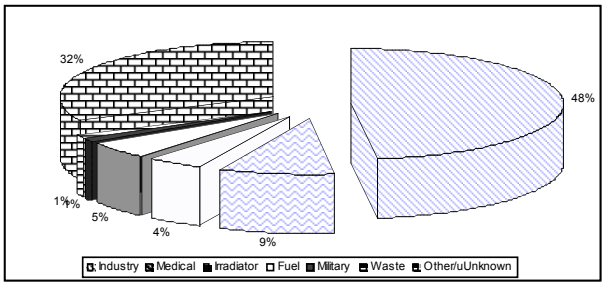

Figure 1 Radiation accidents by facility type (1945-2000)[1]

IMPLEMENTATION IN ITALY

Council Directive 2003/122/Euratom was transposed into the Italian Regulatory system on 06.02.2007[2]. This act, according to European guidance, introduced a strict regulatory framework for the control of HASS, from production up to the time they become disused sources. Particularly, the aim of national act is to require that technical, administrative, procedural and structural measures are adopted by manufactures and holders to minimize the probability of malevolent events or management mistakes that may cause the loss of control of sources. Many of the controls required by the HASS

Directive were already implemented in Italian legislation by the D.Lgs 230/95, but European guidance has introduced new roles and responsibilities for manufactures and holders.

In Italy High Activity Sealed Radioactive Sources are widespread and many functions related to public health and inspection are delegated to districts: in Lombardia district (about 9,000,000 inhabitants) at least 140 High Activity Sealed Sources are used (Figure 2) mainly in industry and medicine (Figure 3).

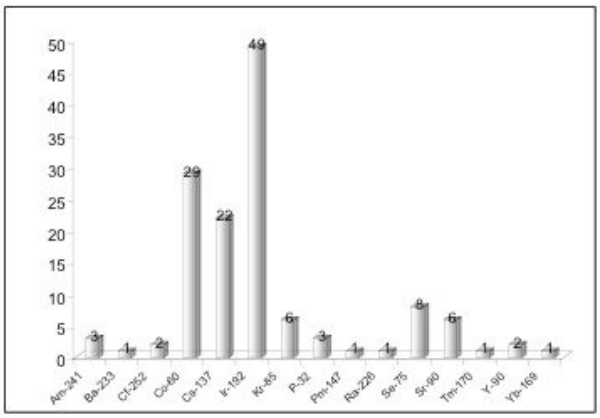

Figure 2 HASS in Lombardia District

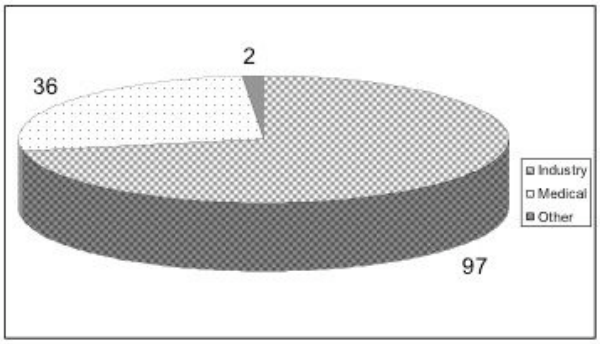

Figure 3 HASS by facility type in Lombardia District

MAIN CHANGES BROUGHT IN BY THE REGULATORY ACT

The Italian regulatory act applies substantially to the same high-activity sources defined in Article 2 of the European directive. To ensure security in the use of HASS the following tools are provided:

a) The holder shall keep records of all sources under his responsibility with regard to their location and their transfer; the records include the information set out in Annex II of European Directive,
b) The holder shall ensure security and traceability in decommissioning of HASS by the following options:
   i. A system of financial security to cover intervention costs relating to decommissioning of HASS,
   ii. The return of HASS to manufacturers or to the National Agency for radioactive waste management.
c) The holder shall ensure that suitable tests are undertaken regularly in order to check and maintain the integrity and identification of each source,
d) The holder shall ensure that suitable administrative activities are undertaken in order to guarantee the HASS location and transfer security and traceability.

Again, particular provisions are provided for practical training in HASS management.

CONCLUSIONS

HASS should be managed in an optimised way, assigning resources based on an evaluation of source characteristics and possibility of its loss of control. In principle one must consider on the following elements:

a) Source categorization based on its characteristics, use and danger[3,4],
b) Analysis of the effects of loss control,
c) Source vulnerability analysis,
d) Extent analysis of radiological risks due to a loss of control of the source combined with evaluation of event possibility,
e) Training in HASS management[5].

This analysis shall allow optimized security measures (technical, administrative, procedural and structural) and to keep the risk of loss of control as low as reasonable achievable. The following paper (freeware at http://www.iaea.org/index.html) are useful when performing the analyses above.

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Patient doses from dental radiography in the UK An analysis of HPA data

P.G. Ramsden (Health Protection Agency, UK)

INTRODUCTION

The UK's Health Protection Agency (HPA) provides radiation protection services to the dental profession through its Dental X-ray Protection Service (DXPS) based within a department of the Radiation Protection Division in Leeds, England.

DXPS has carried out remote assessments of the

performance of intra-oral and panoramic dental x-ray equipment as part of its range of services to the dental profession, for over 30 years. These are the most common type of x-ray sets used by dentists; the intra-oral x-ray set to image one or two teeth and the panoramic set to image the whole of the upper and lower jaws together.

DXPS reports the results of its findings on a regular basis, the most recent being in a 2005 report[1] reviewing data from 2002–4. This report compares data in the 2005 study with that of the previous study in 1999. The 2005 data were also provided to the UK National Patient Dose Database (NPDD) and were a major contributor to the HPA's 2005 review[2] of the NPDD which, alongside the established national reference levels (NRLs) for medical exposures, proposed NRLs for intra-oral and panoramic dental radiography for the first time. These are, in effect, national diagnostic reference levels (DRLs). The concept of DRLs has already been described in a previous Newsletter[3]; in the UK, DRLs are based on the third quartile values of the dose distributions.

This article summarises the full DXPS report concentrating on the underlying causes for observed dose trends.

METHODS

DXPS uses a postal system[4] to assess relevant characteristics of x-ray equipment performance and operation. This involves sending users some DXPS test cassettes for exposure to the x-ray set along with a questionnaire. The test cassettes provide an assessment of the operating parameters of the equipment including a representative measurement of patient dose, while the questionnaire acquires information on radiography procedures. The exposure of an intra-oral test cassette is shown in Figure 1 below.

Figure 1 Exposure of an intra-oral test cassette

To be able to objectively compare doses between different x-ray sets and between the two studies, standard exposure conditions had to be selected. For intra-oral equipment these were the settings used for an adult mandibular molar with the dose quantity measured being the absorbed dose to air at the end of the spacer-director 'cone', in mGy, (essentially the patient entrance dose). With panoramic equipment a standard adult, full mouth scan was selected and the dose quantity measured was dose-area product (DAP), in mGy cm^2 measured at the secondary collimator, just in front of the film cassette.

RESULTS

The distribution of measured patient entrance doses from the assessments of 6344 intra-oral x-ray sets in 1999, and 4006 x-ray sets in 2005, are shown in Figures 2 and 3, below.

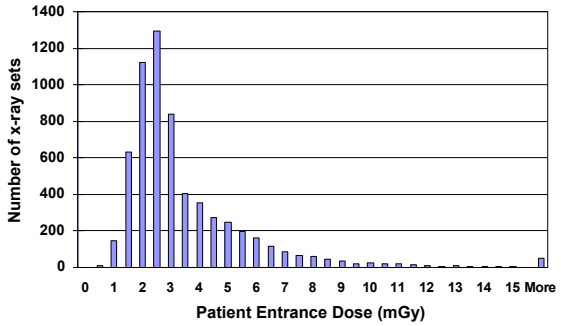

Figure 2 Distribution of patient entrance doses for intra-oral radiographs in the 1999 study

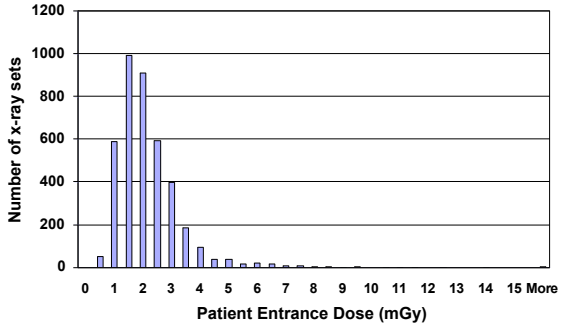

Figure 3 Distribution of patient entrance doses for intra-oral radiographs in the 2005 study

The data show a clear reduction in mean and third quartile doses between the two studies. However, there remains a significant range of doses in both the studies, as shown in Table 1 below.

TABLE 1 Comparison of intra-oral dose data

Parameter	Assessed Value	
	2005 study	1999 study
Highest dose, mGy	30.0	45.7
Lowest dose, mGy	0.05	0.14
Third quartile dose, mGy	2.4	3.9
Mean dose, mGy	1.9	3.3

With reference to the data on panoramic equipment, the distribution of DAP measurements for the 1719 x-ray sets in 2005 are shown in Figure 4, below. The data for 1999 has an almost identical distribution and so has not

been shown here.

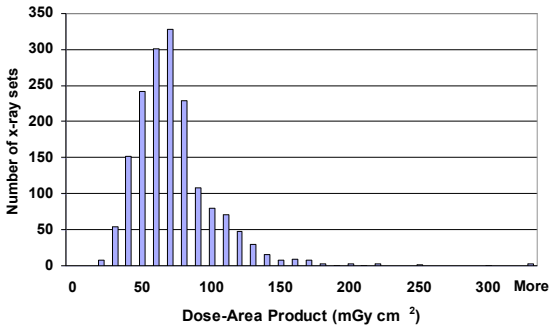

Figure 4 Distribution of DAP values in panoramic x-ray sets in the 2005 study

A reduction in the third quartile DAP values has also taken place between the two studies (see Table 2, below), however, this is to a lesser extent than is evident for intra-oral x-ray sets. A wide range of doses comparable to that observed with intra-oral equipment is also apparent in panoramic doses.

TABLE 2 Comparison of panoramic dose data

Parameter	Assessed Value	
	2005 study	1999 study
Highest DAP, mGy cm^2	444	567
Lowest DAP, mGy cm^2	15	2
Third quartile DAP, mGy cm^2	78	92
Mean DAP, mGy cm^2	68	77

DISCUSSION

Intra-oral data

The 40% reduction in third quartile dose from 3.9 mGy to 2.4 mGy is a significant dose reduction. The main influences on patient dose between the studies are the rated operating potential of the equipment and the speed of the imaging system used.

An x-ray set operating at 70 kV can produce a diagnostically acceptable radiograph delivering just half the patient entrance dose compared to a 50 kV set. In turn, a 50% reduction of patient dose is also achievable when shifting to the use of a faster imaging system.

Most intra-oral x-ray sets have a fixed operating potential. In 1999 there were, in general, two groups of equipment evident in the study; older sets rated at 45-55 kV and more modern equipment rated at 60-70 kV, as shown in Figure 5, below.

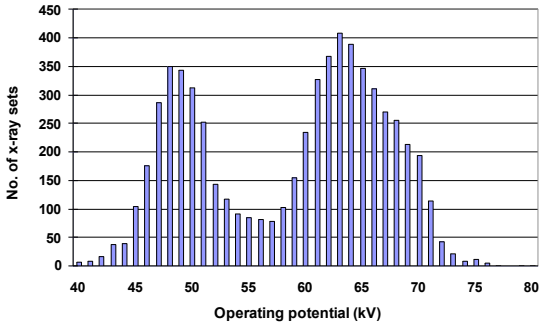

Figure 5 Distribution of operating potentials in intra-oral x-ray sets in the 1999 study

By 2005 the profile of operating potentials had changed considerably with equipment operating in the 45-55 kV range virtually disappearing, as shown in Figure 6, below.

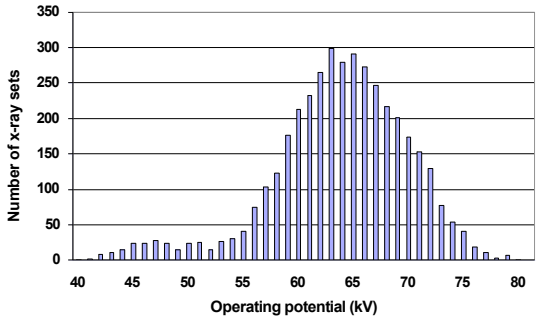

Figure 6 Distribution of operating potentials in intra-oral x-ray sets in the 2005 study

The influence of equipment operating in the 45-55 kV range can be seen most dramatically in the 1999 data where the third quartile dose for equipment in this range was 5.9 mGy compared with that of equipment in the 60-70 kV range whose third quartile dose was 2.5 mGy. With respect to the use of different imaging systems, in the 1999 study 25% of dentists reported using faster films, which had risen to 75% by the 2005 study, contributing significantly to the overall reduction in third quartile doses.

However, it should be noted that a greater reduction in third quartile doses should have been achievable if users had taken full advantage of the changes to x-ray sets and imaging systems. The situation can only be improved when users are trained to be more aware of the capabilities of their equipment and they effectively implement dose reducing measures.

Panoramic data

By contrast to intra-oral equipment, the slight reduction in DAP values for panoramic equipment cannot be attributed to any obvious changes in the technology of equipment or speed of imaging systems. This effect is more likely to be a statistical artefact relating to the sample sizes of the two studies. There are also no anticipated changes to technology that will have a significant effect on doses in the near future. However,

if attention can be focussed on radiography practices to reduce doses that are above the third quartile level, there will be an overall improvement in panoramic doses.

FUTURE TRENDS

Current DXPS data indicates that intra-oral patient doses are continuing to decrease. The use of faster film and the more widespread use of affordable digital imaging systems in intra-oral radiography are likely to be the main technological influences on future dose trends. However, unless effective changes to radiography practice can be made, through increasing awareness and training, the full potential for dose optimisation in intra-oral and panoramic radiography is unlikely to be achieved.

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Incident involving stainless steel sheets contaminated with cobalt 60 in Italy

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DESCRIPTION OF THE INCIDENT

Between January and February 2008, the *Carabinieri of Environmental Care Command – Radioactive Materials Pollution Unit*, supported by APAT (Italian Environmental Protection Agency) and other Competent Authorities, seized 3 hot rolled stainless steel sheets in coils contaminated by cobalt 60. Each coil weighs about 10 tons and is made of sheets 6 mm thick (see figure below). Probably they are part of a single casting. Fortunately, they were destined for industrial applications (like tanks, chimneys, pulleys) not for domestic use.

The shipment was a combined transport of many containers from China to an Italian plant through a South Korean export society. The same ship carried more than 180,000 tons of steel, but only these 3 coils were contaminated. The other coils had different thickness or different identification number.
The dose-rate at contact was about 20 μSv/h (52 μSv/h inside the coils) and 4 μSv/h at one meter.

In steel factories, cobalt sources are used in the blast furnace to check the thickness of the walls. If the maintenance works are not adequate, the sources can fall in contaminating all the melt.

In Italy, radiometric checks are compulsory only on metal scraps and not on other metallic products. In some harbours not all the imported containers are investigated by portal monitor or handhold instruments. For these reasons, the contamination was discovered later, only after the radiometric check of metal scraps coming out from the steel works in the factories. At the end of the investigations, more than ten persons were reported to the public persecutor for many offences against the environment and all the contaminated steel were seized in Italy and the others countries where it has been exported (Croatia, Turkey, Egypt and Poland).

LESSONS LEARNED

The seizure of contaminated steel and other similar events that have happened in Italy in the past, clearly demonstrate that the problem of orphan sources involves not only scrap metal but the semi-finished products, too. In conclusion, radiometric checks should be compulsory on all metal products. The Italian law is changing in this way.

Dissemination and extension of radiological protection networking to new shapes and scopes

C. Lefaure (Independent expert, France)

The 90's have been characterized by new development of standards, socio-political and technological evolutions which all have had an impact on radiological risk management. From the standards point of view, ICRP, IAEA, EC and national authorities have in particular largely developed the concept of ALARA and how to implement it. From a socio-political point of view, this period has seen an increase in the so-called stakeholders demand to participate in many collective and individual decisions processes when dealing in particular with risk management. From the

technological point of view the period has seen the emergence and wide diffusion of totally new communication means such as the internet and email. That evolution has induced (and led to) the emergence of a second generation of networks in radiological protection, after the first one composed of the national radiological protection associations set up after the Second World War. Two of the first networks from that second generation are the International System on Occupational Exposure (ISOE) and the European ALARA Network (EAN). Their success has led the international Agencies (IAEA, ILO, WHO) to support the setting up of ALARA networks in other regions of the world. Up to now two such networks have been launched with th financial support of the IAEA. The first one, the RECAN network has been set up in 2006 within the European and Central Asia region. The second one, the ARAN network is more recent (December 2007); it has been set up with the participation of the East Asian and Pacific countries.

The IAEA intends to promote the setting up of such ALARA networks in other world regions such as Latin America, English speaking Africa, French speaking Africa, the Middle East…

In the last five years other types of networks putting together different types of stakeholders have been set up both at the international level and more recently at local level within a country.

At the international level, some of them are devoted to a specific topic covering all uses of ionising radiations: this is the case in Europe of the EUTERP (European Training and Education in Radiation Protection Platform, 2006) which has been established with the support of the European Commission with the objective of favouring harmonisation in the field of education and training systems for radiation protection experts and better integrating radiation protection education and training systems into general vocational training and education infrastructures. This is also the case in Europe for the self supported ERPAN (European Radiation Authority Network 2006), which aims to promote communication between inspectors belonging to national regulatory bodies… in order to promote the ALARA principle… Some others are totally devoted to the management of radiological risk in a specific domain as it is the case in Asia for the Asian Network of Interventional Cardiologists focussing on Radiation Protection (2007), which makes use of a web forum and produces newsletters. This is also the case of the NORM ALARA Network (2007) in Europe, which is supported by the European Commission to favour ALARA implementation within the NORM industries.

At a local level, many qualified experts in radiological protection working in the non-nuclear sector (research, industry…) where the radiological risk is not a priority, feel quite isolated. Therefore in the last few years, at least in France, they have set up local inter-sector networks relying on e-mail exchanges, internet forums and regular meetings with all types of concerned stakeholders in their region: labour physicians, qualified experts, radiographers, lawyers, environmental associations, local administration and trade unions representatives… These networks have quickly proved their efficiency and are now considered as important tools for exchanging feedback experiences, discussing the actual impacts of evolution of regulations, benefiting from workplace analysis case studies.

During the nineties and later on, as an answer to the evolution of the socio political demand and thanks to the technological communication means, a second generation of radiological protection networks has grown up. They are set up on different geographical bases from worldwide networks to very local ones; they sometimes cover a specific topic (training for example) or a specific domain (cardiology for example), they are more often multi-topic and multi-sectorial; they rely on communication and exchanges through direct contacts, most often complemented by emails , web sites and fora… The future is totally open for new networks and new types of networks… A special session devoted to that future will be held at the IRPA 12 in Buenos Aires end of October (see the programme of that session in the News).

EU Scientific Seminar 2007 "Emerging issues on tritium and low energy beta emitters"

S. Mundigl (Radiation Protection Unit, EC)

BACKGROUND

The European Commission organises every year, in cooperation with the Group of Experts referred to in Article 31 of the Euratom Treaty, a Scientific Seminar on emerging issues in radiation protection – generally addressing new research findings with potential policy and/or regulatory implications. Leading scientists are invited to present the status of scientific knowledge in the selected topic. Based on the outcome of the Scientific Seminar, the Group of Experts referred to in Article 31 of the Euratom Treaty may recommend research, regulatory or legislative initiatives. The European Commission takes into account the conclusions of the Experts when setting up its radiation protection programme. The Experts' conclusions are valuable input to the process of reviewing and potentially revising European radiation protection legislation.

THE 2007 SCIENTIFIC SEMINAR

In 2007, the Scientific Seminar discussed "Emerging issues on tritium and low energy beta emitters". Renowned scientists reported on the relevance of the concept of dose for low energy beta emitters, on metabolism, radiobiology and epidemiology of tritium, on tritium in the environment: sources, measurements

and transfer, and on tritium in fusion facilities. The seminar raised a few issues which merit further attention such as the biological impact of incorporated tritium which may have to be reconsidered with regard to new data on risk from organically bound tritium. The seminar pointed at the need for research, for example in epidemiological studies on the effects of tritium, biotransformation and food accumulation, in particular of organically bound tritium, effects in early pregnancy, and the impact of tritium particulates. The same issues may arise for other radionuclides emitting low energy beta or Auger electrons. Finally, the seminar opened the discussion with the fusion community on tritium issues.

CONCLUSIONS

The Working Party on Research Implications on Health and Safety Standards, a working party of the above mentioned Article 31 Group of Experts, came to the following conclusions:

The radio-toxicity of tritium is considered low, indeed among the lowest of several hundred radio-isotopes. Notwithstanding this, tritium remains of interest in radiological protection for several reasons, not least it is both ubiquitous in the environment (from both natural and artificial sources), its particular features as a very low energy beta emitter when it decays, leading to an inhomogeneous energy deposition at a sub cellular scale, and its potential future significance should nuclear fusion become a major source of energy generation in the 21st century.

There is broad consensus that the current provisions within the system of radiation protection for tritium are broadly adequate subject to the following reservations / refinements:

i) There is increasing evidence that the RBE of tritium is greater than one and that a value of two better reflects the available scientific evidence; consideration should be given at national / regional / international levels to an upward revision in the radiation weighting factor for tritium from one to two, with the objective of improving the coherence of the radiation protection system.

ii) The increased radio-toxicity of organically bound tritium (OBT) – compared with tritium in the form of tritiated water – is well recognised and taken account of within the radiological protection system. Some concerns remain, however, over the relevance of the concept of dose in an organ or tissue in those cases where the distribution of doses is very heterogeneous, in particular where biologically more sensitive structures are preferentially exposed – for example where tritium is incorporated within DNA (e.g. thymidine) or histone precursors (e.g., arginine). Further research into the biological effectiveness of tritium incorporated into such forms, especially during various stages of pregnancy, would resolve these concerns or indicate a need for additional protection measures.

iii) The levels specified for tritium in *CODEX Alimentarius levels for radionuclides in foods contaminated following a nuclear or radiological emergency for use in international trade* were derived generically for application to low energy beta emitters as a group. Significantly, different levels could result had they been derived explicitly for tritium. Given the ubiquitousness of tritium and its increasing importance in the context of fusion energy, consideration should be given to tritium being addressed explicitly in any future revision of CODEX Alimentarius – and of *Euratom Council Regulation laying down maximum permitted levels of radioactive contamination of foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency*.

iv) Fusion is expected to make an increasing contribution to energy generation in the second half of the 21st century. This will lead to increased holding of tritium in the fuel cycle, increased occupational exposure (including to tritiated particles) and increasing accumulations of tritium contaminated wastes. In this context, the scientific basis underpinning radiation protection in respect of tritium should be further enhanced, in particular the quantitative assessment of the transformation of HTO into OBT (in particular into DNA and histone precursors) by organisms and the transfer of these compounds through the food chain to humans. Particular attention should be given to establishing direct human evidence of the risks of exposure to tritium from epidemiological studies of appropriate cohorts. Those exposed in the production and use of tritium in defence activities and in the operation of heavy water reactors offer considerable potential in this respect.

FURTHER INFORMATION

The proceedings of the seminar will soon be published in the Radiation Protection Series of the European Commission (Issue RP-152) and can be downloaded from the Europa web site:
http://ec.europa.eu/energy/nuclear/radioprotection/publication_en.htm

In addition, the programme of the seminar and all presentations can be found on the Europa web site:
http://ec.europa.eu/energy/nuclear/radioprotection/seminars_en.htm

ALARA NEWS

❑ 12th International IRPA Congress – Specific session on networking

The 12th International Congress of the International Radiation Protection Association will take place in Buenos Aires (Argentina) from October 19 to 24, 2008.

On Thursday 23 October, a specific session, chaired by Christian Lefaure (France) and co-chaired by Rosenthal (Brazil) will be dedicated to "Roles and impacts of networking in radiological protection among two centuries".

Keynote paper:
The Evolution of Networking in radiological protection: from health physics Professionals to all concerned stakeholders – *C. Lefaure, R. Czarwinski (IAEA), A. Janssens (EC), E. Lazo (NEA/OECD), S. Niu (WHO), M.R. Perez (WHO), P. Deboodt (IAEA), P. Croüail (CEPN)*

Round Table
- International organisations and international networks: point of view of the European Commission – *A. Jansenss (EC)*
- National regulatory bodies and international networks: point of view of the South Korean regulatory body – *S. Na* (South Korea)
- National and local radiological protection networks: point of view of the French regulatory body – *J.L. Godet (France)*
- Experience of an international network in radiological protection in Latin American countries – *E. Medina Gironzini (Peru)*
- The role of a regulatory bodies network: the Hispano Latino American forum – A. de los Reyes (Spain)
- Needs for the networking in the medical area: the point of view of the medical radiographers – *P. Johnson (ISRRT, Puerto Rico)*
- How to take care of radiological protection within professional associations: the point of view of the cardiologists in Latin American countries – *A. Duran (Uruguay)*
- Role and value of networks in emergency situations – *J. Croft (UK)*

Debate with the floor

More information can be found on the congress' Web Site: http://www.irpa112.org.ar.

❑ International workshop on Depleted Uranium research

The Rome-based Istituto Superiore di Sanità (ISS, Italian National Institute of Health) has organised the international workshop "Depleted uranium research: an update", for December 17th, 2008. Some of the key issues which will be addressed are the epidemiological study of personnel exposed to Depleted Uranium (DU), study of its biological effects, and environmental and biological monitoring. A round table about the prospects and future programmes in DU research will conclude the workshop. Simultaneous English-Italian translation will be available. Participation is free. However, for organisational reasons, registration is compulsory and should be sent by fax or e-mail to the Technical Secretariat within October 30, 2008. For the programme, the registration form and further information please contact:

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Scientific Committee
Martino Grandolfo, ISS
Susanna Lagorio (chairperson), ISS
Cristina Nuccetelli (chairperson), ISS
Serena Risica, ISS.

❑ European Commission's Radiation Protection Programme on the EUROPA website

Information on the radiation protection programme, activities and projects of the European Commission can be found on the EUROPA website under the following link:
http://ec.europa.eu/energy/nuclear/radioprotection/index_en.htm

The following information can be found:
- An introduction to the radiation protection programme of the European Commission,
- Community radiation protection legislation,
- Information on meetings and opinions of the Group of Experts referred to in Article 31 of the Euratom Treaty,
- Topics, programmes and proceedings of the annual scientific seminars on emerging issues in radiation protection,
- Publications in the Radiation Protection Series of the European Commission,
- …

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12th European ALARA Network Workshop
"ALARA issue arising for Safety and Security
of Radiation Sources and Security Screening Devices"
Vienna – 21-23 October 2009

Background and objectives

Radiation protection has always included security-related provisions, for example measures to prevent the unauthorised use and illegal transfer of sources, which have contributed to the overall system of radiation safety. In recent years, however, interest in security issues has dramatically increased and the challenge is to ensure that safety and security measures are designed and implemented in an integrated manner so that security measures do not compromise safety and safety measures do not compromise security.

The aim of the workshop is 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.

As with previous workshops, this workshop will consist of invited presentations intended to highlight the main issues, and a significant part of the programme will be devoted to discussions within working groups. From these discussions, participants will be expected to produce recommendations on ALARA in protection, safety and security, addressed to relevant local, national and international stakeholders.

Scope of the Workshop

The workshop programme includes the following subjects:

- **Introduction and scene setting:**
  IAEA initiatives on the Safety and Security of Radiation Sources; EU HASS Directive; ICRP Publications 96, 100 and 103; international initiatives since 9/11; and how each of these addresses the ALARA principle.
- **Safety and security measures:**
  Proportionality and balance in safety and security, national regulatory programmes; and practical examples of ALARA in the implementation of security measures in different sectors and practices.
- **Planned exposure situations:**
  Exposures arising from the implementation of security measures (workers, security personnel, public); training of security personnel and other peripheral workers; and practical examples of planned recovery operations.
- **Emergency situation management (especially due to malevolent acts):**
  National strategies and cross-boundary effects; exposure and training of first responders; estimation and control of public doses; and feedback from incidents and lessons learned.
- **Justification and optimisation in the use of security screening devices**
  X-ray screening of passengers and other persons; the scanning and inspection of vehicles and containers; and fixed and portable baggage inspection systems.

Working Group Topics

- Implementation of the Code of Conduct and HASS – ensuring ALARA
- Balancing security and safety – how to achieve an optimum solution
- Protection goals and criteria
- Education and training of workers, first responders and peripheral workers
- Management of emergency exposure situations from an ALARA perspective
- Justification and optimisation in the use of security devices

Target Audience

The workshop should be of interest to a variety of stakeholders including employers, regulatory bodies, providers of security devices, research and other organisations with an interest in the combined issues of safety and security. The number of participants will be restricted to a maximum of 90.

Venue, registration and fees

The workshop will take place at the Austrian Standards Institute (Heinestrasse 38, A-1020 Vienna, Austria), starting on the morning of Wednesday 21st of October and finishing on the afternoon of Friday 23rd October 2009. The attendance fee will be **400** €.

Participants should register before 15 July 2009 via the Workshop Website: www.alara2009.at