Human Performance in Risk Management.

ACRP-CRPA/CRSO ANNUAL CONFERENCE

Montréal – 2009

ABSTRACTS & SCIENTIFIC PROGRAM

ASSOCIATION CANADIENNE
DE RADIOPROTECTION

CANADIAN RADIATION
PROTECTION ASSOCIATION

WELCOME TO MONTRÉAL

The Canadian Radiation Protection Association met formally in Montreal for the first time in 1980. It then established clearly its objectives to support the dissemination of knowledge, the search and dissemination of standards of professional practices in radiation protection. After maintaining 29 years of existence, the CRPA has a very great number of achievements behind it:

- During the last 29 years, successful annual scientific meetings with always excellent presentations from Canadian and international scientists;
- International recognition through our membership with the International Radiation Protection Association and host of the 1992 congress of IRPA;
- Establishment of a program of professional recognition for Radiation safety professionals with the first certification exam held in 2005.

The organization of a Canadian congress in radiation protection is always a stimulating challenge and the preparation of this vintage 2009 did not make exception. The difficulties and the bounces were numerous: (1) required to change the place of meeting four months ago, (2) world economic recession which had a considerable impact on the capacity of our participants to join us and finally the AH1N1 which until the last minute threatened to retain our participants and lecturers. Our Local Organization Committee whose members revolve around Montreal, Sherbrooke and Ottawa, our scientific committee chaired by Stephane Jean-François and Manon Rouleau as well as the CRPA Board of Directors chaired by Gary Wilson did everything brilliantly and shown incomparable human performances in the management of all these elements of risks which were drawn up in front of us. With some 50 communications and more than 170 participants, it is with a very great happiness that we welcome you in Montreal for this congress 2009.

Jean-Pierre Gauvin

President,

Local Organization Committee CRPA 2009

KEYNOTE SPEAKER

Mr. Jean-Yves Fiset, Eng., Ph.D.

Senior Human Factors Specialist, Canadian Nuclear Safety Commission

Jean-Yves Fiset is a senior human factors specialist with the CNSC since 2004, where he carries out assessments and inspections in the area of human factors and human and organizational performance. He works part-time at the CNSC. He is also active in research and teaching. Since 1994, he has been teaching graduate courses at École Polytechnique de Montréal in the area of human factors applied to complex systems. He has also done analysis, design and evaluations related to the incorporation of human factors in work stations and organizations in a variety of domains (e.g., nuclear, health, banking, web, aerospace).

He is a licensed engineer in the Province of Québec. He earned a B.Ing. at École Polytechnique, and completed graduate studies (M.A.Sc and Ph.D) with research and course credits in human factors, cognitive psychology and artificial intelligence.

		MONDAY
7:30		**REGISTRATION**
8:00		
	Session 1	**ROOM: AUDITORIUM**
8:30		**Conference Opening**
9:00		***Improving Human Performance-Myths, Reality and Ideas***
9:30		**Jean-Yves Fiset - CCSN**
10:00		**Coffee Break with our exhibitors** **Room: Les Courant and St Laurent**
10:30		***An effective learning culture and an effective safety management system-The critical relationship*** **Maury Hill - Maury Hill and Associates**
11:10		***Human Performance Management – Human Factors Considerations*** **Alice Salway - CNSC**
11:40		***Human Performance in Radiation Protection at Gentilly II*** **Sylvain Fréchette - Hydro-Québec**
12:10		**Lunch-Free Time**
12:30		
13:00		
		ROOM: AUDITORIUM
13:30	**Session 2**	***The international framework for radiation safety - History, Science, philosophy and practice*** **Chris Clement – ICRP**
14:00		
14:30		***From ICRP 60 to ICRP 103: The evolution of the new recommendations of the International Commission on Radiological Protection*** **Richard Osborne - Ranasara Consultants**
15:00		**Coffee Break with our exhibitors** **Room: Les Courants and St Laurent**
15:30		***Mitigation of Risk from Human Performance through Automation and Statistical Verification*** **Kirk Lamont - Cameco Corporation**
16:00		***Incident Learning in Radiation Therapy : the Ottawa Experience*** **Brenda Clark - Hospital cancer Centre**
16:30		***Safety Management Systems and Nuclear/Radiation safety*** **Éric Beaupré - International Safety Research**
17:00		**Winning presentation-Anthony MacKay Student Paper Contest** ***Biological Effects of Alpha Particle Exposure in Human Monocytic Cells*** **Matthew Howland – Health Canada**
18:00		**Exhibitors' Cocktail Reception** **Room: Les courants et St-Laurent**

Scientific Poster Session : Les Terrasses.

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Title :Improving Human Performance – Myths, Reality and Ideas.	
Author(s) : Jean-Yves Fiset	
Speaker(s) :Jean-Yves Fiset	Email: jean-yves.fiset@cnsc-ccsn.gc.ca
Employer : CNSC	Session : Human Factor
Summary :It is now well-established that human performance is at the root of several of the challenges that most organizations face, especially in operations where safety is important. Unsurprisingly, efforts have been undertaken in many organizations to improve human performance. Those efforts have not always been as successful as one might have expected. This talk will discuss some myths that exist about human performance and will share some lessons that have been learned in human factors and human performance to help improve the situation.	

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Title :An effective learning culture and an effective safety management system - the critical relationship	
Author(s) : Maury Hill, MSc.	
Speaker(s) :Maury Hill, MSc.	Email:mauryhill@rogers.com
Employer : Maury Hill and Associates, Inc.	Session : Human Factor
Summary :Safety Management Systems are established to allow organizations to manage their risks in a systematic manner. An organization's shared values, beliefs and behavioural norms surrounding safety will ultimately determine if an SMS will be effective. The presentation will discuss the critical relationship between an effective organizational learning culture (a component of an effective safety culture) and an effective SMS. Cognitive obsticles to good risk assessment/risk management - those biases and other "normal" human performance issues that impact the risk management process - will also be addressed.	

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Title :Human Performance Management – Human Factors Considerations	
Author(s) : Alice salway	
Speaker(s) :Alice Salway	Email:alice.salway@cnsc-ccsn.gc.ca
Employer : CNSC	Session : Human Factor

Summary :

"Human Performance" can be defined as the outcomes of human behaviours, functions and actions in a specified environment, reflecting the ability of workers and management to meet the system's defined performance, under the conditions in which the system will be employed. Power reactor licensees in Canada have developed programs to manage Human Performance, where the goal is to continually reduce Human Performance events and errors and to manage defences, in pursuit of zero events of consequence. Human Performance Programs are therefore concerned with preventing human failures (a term used to include both errors and violations) by ensuring appropriate support to the people performing work tasks.

Industry experience shows that almost every significant event is influenced by Human Performance i.e., by human failures of different types made by different people [1]. Human Performance is therefore an essential aspect of maintaining the integrity of defences important to safety.

This paper will consider different "Human Factors" that impact on Human Performance, and therefore which can be considered in a Human Performance Program. The Canadian Nuclear Safety Commission defines Human Factors as "factors that influence Human Performance" as it relates to the safety of a nuclear facility or activity over all phases, including design, operation, maintenance and decommissioning. The factors may include the characteristics of the person, task, equipment, workplace, organization, environment and training [2, 3].

Event Free Tools, which focus on minimising "human failures" as opposed to "system failures", are generally a prominent aspect of Human Performance Programs. Event Free Tools are an extremely important last line-of-defence, but this emphasis does not promote consideration of non-behavioural, systemic factors i.e., changes to design, management or procedures. The underlying causes of Human Performance problems that need to be corrected are likely to be among these non-behavioural factors.

Opportunities to improve Human Performance may be missed if there is too strong an emphasis on Event Free Tools in Human Performance Programs. Consideration of a range of human factors is proposed for the management of Human Performance.

References:
[1] The Energy Institute, Guidance on investigating and analyzing human and organizational factors aspects of incidents and accidents, (2008), ISBN 978 0 85293 521 7, London England.
[2] Canadian Nuclear Safety Commission Regulatory Policy P-119: Policy on Human Factors (2000)
[3] Canadian Nuclear Safety Commission Regulatory Guide G-276: Human Factors Engineering Program Plans (2003).

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Title :Human Performance in Radiation Protection at Gentilly II	
Author(s) : Michel Beaudet	
Speaker(s) :Sylvain Fréchette	Email: beaudet.michel@hydro.qc.ca
Employer : Hydro-Québec	Session : Human Factor
Summary :	

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Title :The international framework for radiation safety - History, Science, Philosophy and Practice	
Author(s) : Christopher H. Clement	
Speaker(s) :Christopher H. Clement	Email:sci.sec@icrp.org
Employer : International Commission on Radiological Protection	Session : Human Factor
Summary :X-rays were first discovered by Roentgen in 1895. Within a few months radiation damage to the hands of early experimental investigators was observed, and the following year Wolfram Fuchs gave what is recognized as the first radiation safety advice. Since that time the system of radiological protection has evolved into an almost universally accepted framework based on science, philosophy, and policy. This presentation includes an overview of the history of the development of radiological protection, and focuses on the science and philosophy upon which it is based. Key international organizations in this field are introduced and their roles explained. The main elements of the system as it exists today are described, including how they are implemented in Canada.	

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Title :From ICRP 60 to ICRP 103: The evolution of the new recommendations of the International Commission on Radiological Protection	
Author(s) : Richard V. Osborne	
Speaker(s) :Richard V. Osborne	Email: osborner@magma.ca
Employer : Ranasara Consultants Inc.	Session : Human Factor

Summary :

The new recommendations of the International Commission on Radiological Protection (ICRP), published in 2008, evolved through a very public and energetic process that involved many individuals and organizations from around the world, as well as being the topic of seven international conferences. The NEA, an agency of the Paris-based Organisation for Economic Co-operation and Development (OECD), took a leading role in organizing these conferences and in providing expert group reviews of the successive drafts of the recommendations, from the initial suggestions by the then ICRP Chairman Dr Roger Clarke in the late 1990's to the last draft in 2007. An assessment of how influential this process was in the development of the recommendations has recently been published by the NEA . For the assessment, three colleagues and I identified the topics that had attracted most attention during this process and, for each one, we followed in detail the criticisms and suggestions from the expert groups and conference participants and the responses of the ICRP as the recommendations evolved. The topics we identified were: justification; dose constraints and reference levels; optimization; collective dose; application of the linear non-threshold model; categories of exposure; exclusion, exemption, clearance and authorization; environmental protection; and stakeholder involvement.

Our conclusion was that, in all the topics reviewed, the evolution of the recommendations through the successive drafts did reflect many of the views and criticisms that had been expressed. The process followed has exemplified stakeholder involvement. That the new recommendations do not contain any fundamental changes in policy is an indicator of the overall impact that the interactive process has had, for this was not the direction that some aspects of the recommendations appeared to be taking at the start of the process. As a result, there appears to be no great urgency for national regulators to enact new legislation immediately.

International Commission on Radiological Protection. The 2007 recommendations of the International Commission on Radiological Protection. Oxford: Pergamon Press; ICRP Publication 103; Ann ICRP 37(2–4); 2008.

The NEA contribution to the evolution of the international system of radiological protection. Prepared by R. V. Osborne, W.P. Bines, H. Métivier, T.Oishi. Paris: Organisation for Economic Co-operation and Development; NEA Report No. 6440; 2009.
(available as http://www.nea.fr/html/rp/reports/2009/nea6440_Evolution_Int_System_RP.pdf)

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Title :Mitigation of Risk from Human Performance through Automation and Statistical Verification	
Author(s) : Kirk Lamont	
Speaker(s) :Kirk Lamont	Email:kirk_lamont@cameco.com
Employer : Cameco Corporation	Session : Human Factor
Summary :Certain aspects of human performance during routine tasks can result in increased risk of health and safety factors associated with the task. In many circumstances performance can be streamlined through training to reduce potential risks. However, in other circumstances risk factors remain high due to human performance and inherent issues with the specific tasks. This presentation explains how uranium ore concentrate is shipped in 45 gallon IP-2 containers at Cameco Corporation's Key Lake facility, and how risk of contamination to the public from these shipments is controlled by Key Lake. Background will be given on the manual tasks that were historically completed to clean these containers, and how an auto mated cleaning process was implemented to reduce risk of contamination to the shipments. A statistical based conclusion will be given to show how the risk of contamination was reduced by utilizing an automated system.	

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Title :Incident Learning in Radiation Therapy : the Ottawa Experience	
Author(s) : Brenda G. Clark	
Speaker(s) :Brenda G. Clark	Email:brclark@Ottawahospital.on.ca
Employer : Ottawa Hospital cancer Centre	Session : Human Factor

Summary :
We have implemented a comprehensive incident learning system in our radiation treatment program in Ottawa. The system tracks all "unwanted or unexpected changes from a normal sytem behavior that cause or has the potential to cause adverse effect to persons or equipment", thus tracking potential or near misses as well as actual incidents. We have found this to be a powerfull tool in the improvement of quality in our program and to increase the safety of our patient treatments.

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Title : Safety Management, Management Systems and Nuclear/Radiation Safety	
Author(s) : International Safety Research (ISR)	
Speaker(s) :Eric Beaupre	Email:beaupre@i-s-r.ca
Employer : International Safety Research	Session : Human Factor
Summary :Safety management is becoming a bigger and bigger part of what we do on a daily basis. Lessons learned from industry experience and research performed by leading experts show that safety can be best managed through the use of management systems. However, there are a plethora of appraoches to manage safety using management systems; which one will serve you best? During this discussion, International Safety Research (ISR) will share their experience working with safety management systems with the aviation industry, military operational and radiological research facilities and the civilian nuclear industry. This discussion will focus on key aspects of the safety management systems (their differences and similarities) and challenges and lessons learned during their implementation.	

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Title :Biological Effects of Alpha Particle Exposure in Human Monocytic Cells	
Author(s) : Matthew Howland and Vinita Chauhan	
Speaker(s) :Matthew Howland	Email: matthew_howland@hc-sc.gc.ca
Employer : Health Canada	Session : Human Factor

Summary :Recently, increasing evidence from a large number of epidemiological uranium miner studies have shown that alpha (α)-particles produced from radon progeny induce lung carcinogenesis. In order to obtain deeper insight into the molecular mechanism causing these adverse effects, experiments were designed to investigate the induction and repair of DNA double strand breaks (DSBs) and the release of pro-inflammatory chemokines from human peripheral blood cells exposed to α-radiation. Human peripheral blood monocytic cells (THP-1) were irradiated on six 241Am electroplated stainless steel discs with activities averaging 68 kBq. Cell cultures were exposed to α-radiation at doses ranging from 0-1 Gy (dose rate=0.42 Gy/h). Alpha-exposed and non-exposed cell cultures were harvested and cell pellets were analyzed for various endpoints. The detection of DNA strand breaks was assessed by using the alkaline comet assay. Cell culture supernatants were assessed for the presence of a series of human chemokines (RANTES, CXC-IP10, IL-8, CXC9/MIG and CC12/MCP-1) using a cytometric bead array assay. DNA damage and subsequent repair was assessed by examining the formation of γ-H2AX at DNA DSB sites. Cells irradiated with α-particles ranging from 0.1-1 Gy showed statistically significant dose-dependant increases ($p<0.05$) in γ-H2AX formation, with the highest tested dose (1 Gy) causing ~10 fold increase in γ-H2AX. The comet assay showed no significant DNA damage following cell irradiation at low doses (0.25, 0.5, 0.75 Gy) relative to the control cells, potentially due to the induction of DNA repair mechanisms. The detection of pro-inflammatory chemokine secretion in the cell culture media showed linear dose-response effects with statistically significant increases observed at the highest dose of exposure for the chemokines IL-8, RANTES and CXC-IP10. These results indicate that alpha radiation induces biological effects that may, however, be partially compensated for by the activation of cellular repair processes.

		TUESDAY

7:00		**CRPA–R Exam Coaching**	
7:30		Room: St-Charles	
8:00		**REGISTRATION**	
		Room : AUDITORIUM	**Room : ST-CHARLES**
8:30	**Session 3**	***Quality Control within the Quebec Breast Cancer Screening Program)*** **Richard Tremblay & Régent Beaulieu – MSSS & Cegep de Ste-Foy**	***Radiation Analysis for the Upgrade to the LINAC Access Control and Interlock System at the Canadian Light Source*** **Grant Cubbon - CLS**
9:00			***Modern Radiation Applications Utilizing Nanotechnology*** **Ray Ilson - Dalhousie University**
9:30		***New Technology Implementation In Radiation Oncology : The First Cyberknife® In Canada !!!*** **Aimée Lauzon - CHUM**	***Radiation Safety as a Model for Hazardous Material Safety Programs*** **Ray Ilson - Dalhousie University**
10:00		**Coffee Break with our exhibitors**	
10:30		***Dose studies in tomodensitometry*** **Normand Nadon - APIBQ**	***Lowdown on Waste (Waste Management)*** **Ali Shoustarian –U. of Ottawa**
11:00		***Medical Imaging Dose in CT and other modalities*** **Nagi Sharoubim - Consultant**	***Centralized Radioactive Material Inventory at the University of Manitoba*** **Eva Sailerova & Leona Page – University of Manitoba**
11:30			***Source recovery program*** **Andrew Tompkins – Los Alamos Laboratories**
12:00		**Lunch-Free time**	
12:30			

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Title : Quality Control within the Quebec Breast Cancer Screening Program	
Author(s) : Richard Tremblay, Régent Beaulieu	
Speaker(s) : Richard Tremblay & Régent Beaulieu	Email: richard.tremblay@msss.gouv.qc.ca & rbeaulieu@cegep-ste-foy.qc.ca
Employer : Ministère de la santé et des services sociaux & Cégep de Sainte-Foy	Session : Medical
Summary : The Québec Breast Cancer Screening Program has been gradually implemented for over 10 years. We will present the various quality control documents that are in place for the technologist, the physician, as well as the program's website and "CQ-Mammo" – our software tool that performs mammography QC. We will also discuss the certification process for mammography centres. In keeping with the conference theme, we shall focus on human factors associated with the use of these tools.	

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Title :Radiation Analysis for the Upgrade to the LINAC Access Control and Interlock System at the Canadian Light Source	
Author(s) : Cubbon, G.E.; Benmerrouche, M.; Cowles, L	
Speaker(s) :Grant Cubbon	Email:grant.cubbon@lightsource.ca
Employer : Canadian Light Source Inc.	Session : Academic
Summary :The Canadian Light Source (CLS) synchrotron facility presently consists of a 250 MeV LINAC, a Booster Ring to ramp the electron beam from 250 MeV to 2.9 GeV, a 2.9 GeV Storage Ring, and 13 experimental beamlines ranging from infrared to hard x-rays. Personnel are protected from radiation and other hazards associated with operation of the accelerator and photon beamlines through the use of an Access Control and Interlock System (ACIS). The ACIS for the Booster Ring, Storage Ring, and Phase I beamlines was completed by 2005. Phase II beamline ACIS installation was completed in 2008. The LINAC ACIS however has been in operation for over 20 years as part of a previous facility. A plan to upgrade the existing LINAC ACIS to the same standard as the current ACIS used for the Booster Ring, Storage Ring, and beamlines is in place. Since the changes proposed for the LINAC ACIS upgrade include removal of access restrictions to some areas, a radiation analysis was required. Prelimi nary radiation measurements of areas proposed for removal from the ACIS zones began in 2007 using Luxel dosimeters. A detailed set of active and passive radiation measurements were completed during a test of normal LINAC operation and various â€˜worst caseâ€™ scenarios on March 12th, 2008. Theoretical beam loss calculations showing the impact on radiation levels in the affected areas were completed to ensure conformance with CLS shielding design requirements. An overview of the ACIS upgrade and the radiation analysis will be discussed.	

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Title : Modern Radiation Applications Utilizing Nanotechnology	
Auhor(s) : Martin Gillis, Stephen Ellis, Pauline Jones, Raymond Ilson	
Speaker(s) :Raymond Ilson	Email : raymond.ilson@DAL.CA
Employer : Dalhousie University	Session :Academic

Résumé : Nanotechnology is a rapidly growing area in engineering, medicine and science, dealing with functional systems with dimensions of 0.1 to 100 nm.

Nanotechnology is having a major impact on medical and industrial applications now and is expected to have a greater impact in the future. Recent examples of the interaction of nanoscience applications with radiation will be discussed. A few examples include
Medical applications to protect healthy cells:
Cerium oxide nanoparticles have been utilized to protect healthy cells from radiation – a useful mechanism for protecting healthy cells near irradiated tumours. Using a breast cancer model, almost 100 percent of the normal breast cancer cells survived a normally lethal dose of radiation which successfully destroyed the breast tumours. Additional bonuses – healthy cells take up more of the cerium nanoparticles than do the malignant cells and the nanoparticles are long-lived and thus may confer radio-resistance over a therapy regimen.
Medical applications to increase killing of tumour cells:
Radiation therapy is a major part of modern cancer therapy. However, its use can be restricted by the resistance of some cancer cells to radiation. Researchers have now shown that pretreating tumors, often highly vascularized, with gold nanoparticles and near-infrared radiation dramatically improves the effectiveness of radiation therapy. Such pre-treatment induces a temperature increase in tumour cells, known to enhance the success of radiation therapy.
Satellites and space travel – facilitating Missions:
All satellites, military and commercial, suffer from solar cell degradation due to the effects of radiation. As well, significant improvements in propulsion systems will be required to take us to Mars and perhaps beyond. Researchers are studying novel nanostructures based on Quantum Dots (QD) for future nano-devices for space applications deriving energy from sunlight. New photovoltaic (PV) structures based on QD nanotechnology provide improved efficiency because they maximize the absorption of different light wavelengths ("multicolor" cells). An added bonus, this technology diminishes radiation-induced degradation during the flight, which will reduce the size and weight of solar arrays required for energy conversion – another potential contribution to the efficiency of such systems

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Title : New Technology Implementation In Radiation Oncology : The First Cyberknife® In Canada	
Author(s) : Aimee Lauzon, Lysanne Normandeau, Robert J. Doucet	
Speaker(s) : Aimee Lauzon	Email: aimee.lauzon.chum@ssss.gouv.qc.ca
Employer : CHUM	Session : Medical
Summary : In 2009, the Centre hospitalier de l'Université de Montréal (CHUM) will proceed in the decommissioning of three linear accelerators. Since one of its mission is to evaluate new medical technologies, the CHUM has decided to acquire two tomotherapy units and the first Cyberknife® system in Canada, a non-invasive robotic stereotactic radiosurgery system. To date, the worldwide workload of the Cyberknife® is more than 50 000 patients treated by close to 150 systems installed. From a radiation safety point of view, the Cyberknife® shielding evaluation, previously a high energy 25 MV linear accelerator room, differs mainly in the primary beam; that is, the Cyberknife® has over than 1 200 possible orientations in almost all directions, compared to a continuous coplanar orientation for a linear accelerator. The first Canadian treatment is planned for mid-June whereas the construction works should be done by the end of April. Medical physicists have therefore less than 2 months for commissioning. Other than clinical pressure due to temporary closing of three rooms, important issues to be considered include intensive staff training, patient protection and dosimetry, slowing down of productivity compensated by the extension of clinical hours, and general vulnerability of a new technology implementation.	

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Title : Radiation Safety as a Model for Hazardous Material Safety Programs	
Author(s) : Raymond Ilson, Martin Gillis, Stephen Ellis, Pauline Jones	
Speaker(s) : Raymond Ilson	Email : raymond.ilson@DAL.CA
Employer : Dalhousie University	Session :Academic

Résumé :Summary :The radiation safety approach will provide the most important components of general hazardous material programs. The potential hazard is recognized, the risk evaluated, and appropriate controls put in place if required. The Dalhousie University radiation safety program includes senior management support, administrative control of usage, regular training, and a regular audit program. The audits provide feedback to senior management to ensure that the program is adequately implemented and remains in compliance with the government and University regulations.

Recognized potential health hazards are generally controlled under federal legislation. The University operates under a Consolidated Radioisotope Licence issued by the CNSC. The Safety Committees/Protection Services are responsible for meeting the requirements of Licences and ensuring compliance. Administrative control is accomplished through the issue of internal permits and control of all procurement of these materials. “In-house” risk-based permits identify the materials, allowable quantities and locations for use, the conditions for usage, and the individual responsible for the project. Only those staff possessing a permit or listed as authorized workers under the direction of a permit holder are allowed to possess and access these materials.

General and hazard specific training courses are offered regularly and staff and students issued safety manuals for future reference. Training courses present basic relevant safety principles, risk-based hazard specific training, biological effects, waste management and detection methods, including detection limits and efficiencies. Administrative controls regarding purchase, use, transfer, and disposal are reviewed. Safe work practices and handling techniques, emergency procedures, and spill response complete the training programs. A written examination provides the course instructors with feedback and a certificate of completion is issued to all successful candidates. Awareness sessions for hazardous materials are provided to staff not actually using the materials but who may have incidental contact with these materials/locations (administrative staff, housekeeping, trades, security…)

All exposures are kept as low as reasonably achievable through a variety of administrative and engineering controls. The possible external hazards generally include airborne, skin, eye and injection routes from the hazardous material itself, hazardous waste products and the potential for physical contamination of staff, the workplace and the environment. Personal dosimeters and exposure assessments may be available and special security precautions are in place as required. Staff are required to maintain complete inventory records based on usage. Liquid and solid waste materials are removed from work areas on a regular basis, but special pickups can usually be arranged if the waste is considered a significant risk.

Exposure to many of these hazards is only potentially harmful if inhalation or ingestion occurs. Ensuring good ventilation and the wearing of protective clothing and gloves when working minimizes the possibility of exposure. Volatile hazardous materials are restricted to use within laboratory hoods, fitted with airflow alarms, to ensure adequate local exhaust ventilation. Finally, bioassay programs may be in place as well, to assess internal exposures by both in vivo and in vitro methods.

Safety Officers routinely perform compliance audits, and disciplinary policies are in place. In addition, inspectors from the federal and provincial authorities regularly visit the workplace. These inspections are generally very thorough in reviewing documentation, observing work practices, and monitoring for contamination or exposures. Follow-up to all inspections and audits, review by senior management, and disciplinary policies serve to reinforce the importance of safety programs. The results of the compliance audits are used to provide feedback in updating and improving the training courses. Finally, emergency response policies and procedures are in place.

Generally, Safety Officers are highly visible in the workplace and have developed excellent working relationships with all members of the University community. A collegial and co-operative approach in managing safety promotes a similar response from staff, students and Faculty.

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Title : CT-Scan dosimetry study, Québec 2008	
Author(s) : Association des physiciens et ingénieurs biomédicaux du Québec	
Speaker(s) :Normand Nadon	Email:nadonn@videotron.ca
Employer : Hôpital du Sacré-Coeur	Session : Medical

Summary :
In Mach 2008, a study sponsored by the APIBQ, with the collaboration of the ARQ and the OTRQ, allowed us to draw a picture of the situation in Quebec regarding the doses received by patients during CT-scan. We will present you the results of this study, we will draw a parallele with the recommandations established by other countries and we will give you an overview of the approachs that will allow an actualisation of the practices in radiation safety.

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Title :Lowdown on Waste (Waste Management)	
Author(s) : Ali Shoushtarian	
Speaker(s) :Ali Shoushtarian	Email:ashousht@uottawa.ca
Employer : Ottawa University	Session : Academic

Summary :The management of radioactive waste is one of the most serious environmental problems facing Canadians. The main objective in managing and disposing of radioactive waste is to protect people and the environment, while the main challenge is to do so in a cost effective fashion. Disposal of radioactive waste is a complex issue, not only because of the nature of the waste, but also because of the complicated regulatory structure for dealing with radioactive waste. There are a variety of stakeholders affected, and there are a number of regulatory entities involved.

The main waste disposal streams associated with the University are solid waste (off-site or decay), liquid waste (off site (liquid scintillation) or municipal sewer (aqueous waste that meets CNSC requirements)), and biomedical (off-site). Regardless of the waste stream, CNSC regulates what may be disposed of and what activities are authorized. If off-site disposal is used, Transport Canada and Ontario Ministry of the Environment regulations are engaged.

Proper disposal is essential to ensure protection of the health and safety of the public and quality of the environment including air, soil, and water supplies. To address these requirements, the University of Ottawa has an established monitoring and tracking system by implementing a series of wastes tracking logs and waste disposal forms that are initiated at the point of generation and extended to the storage and final disposal of the waste.

Biosolids from the City of Ottawa's sewage treatment facility were recently stopped at the US border, when the radiation detector monitoring the load detected higher-than-acceptable levels. An initial investigation at a sewage treatment plant in Ottawa indicates a commonly-used medical isotope is the source of low levels of radioactivity found in shipments of biosolids from the plant. Office of Risk Management (ORM) was aggressively contacted by 3 media companies to determine if the waste originated from the University. It is therefore critical that the waste management system employed, will facilitate rapid response to media enquires, in order to demonstrate compliance and good governance.

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Title :Medical Imaging dose in CT and other modalities	
Author(s) : Nagi Sharoubim	
Speaker(s) :Nagi Sharoubim	Email: nagi@sharoubim.com
Employer : Consultant	Session : Medical

Summary :

The presentation will consist first of a short revision about skin entrance exposure for general radiographic equipment and the higher dose in special Angiographic procedure where the results are objective.
Second will give some detail steps about CT Dose evaluation with different methods; CTDI, TLD's and MOSFET where the results are some how subjective.
Third we will represent our work with the Gafchromic Film for skin dose evaluation in modern multi slices CT scanners which we believe is real objective.

ACRP/CRPA – CRSO 2009

Title :Radioactive Material Inventory at the University of Manitoba	
Author(s) : Eva Sailerova, Leona Page	
Speaker(s) :Eva Sailerova & Leona Page	Email: eva_sailerova@umanitoba.ca & leona_page@umanitoba.ca
Employer : University of Manitoba	Session : Academic
Summary :Centralized Radioactive Material Inventory at the University of Manitoba Every stock vial and every licensable sealed source is registered with the Radiation Safety Program. Every item is issued a unique serial number generated by our EHS database enabling itemized inventory with detailed information. Integrated waste disposal program allows for timely inventory update. The system would not work without the ordering system allowing only pre-authorized purchases of radioactive material and annual inventory verification. A well designed database which allows you to tie together procurement, partial usage, inventory transfers, decay and waste disposal is a must. Advantages are numerous, effort reasonable. If you want to know more about what is going on in your labs, introduce centralized inventory!	

ACRP/CRPA – CRSO 2009

Title :Source Recovery Program	
Author(s) : Andrew Tompkins	
Speaker(s) : Andrew Tompkins	Email: jatompkins@lanl.gov
Employer : Los Alamos National Laboratory	Session : Academic
Summary :	

		Room : AUDITORIUM	Room : ST-CHARLES
13:00	Session 4	*A Radiation Management System - An Integrated Approach* **Lois Sowden-Plunkett – University of Ottawa**	*Feasibility studies for in vivo nitrogen measurements using prompt gamma neutron activation analysis at McMaster University* **Chantal Green – McMaster University**
13:30		*The World at Your Finger Tips - A Radiation Safety Program Made Easy* **Lois Sowden-Plunkett – University of Ottawa**	*Toward Improving the Detection Limit of Electron Paramagnetic Resonance (EPR) Dosimetry of Drywall (Wallboard)* **Raj Mistry - McMaster University**
14:00		*Rebuilding a Radiation Safety Program: the Road to Success* **Marie Leclerc - UQAM**	*Radiofrequency Radiation Bioeffects Research* **Scott Nichelson - US AirForce**
14:30		**Coffee Break with Our Exhibitors**	
15:00		*Mobile Phones : A Review* **Jean-Philippe Gariepy - CHUM**	*New reactor design features to improve radiation safety performance* **Jag Mohindra- Consultant**
15:30		*Dosimetry of the staff at Gentilly II Nuclear Plan* **Djamel Cherouati- Hydro-Québec**	*Uranium Exploration and Human Health Protection in Canada* **Anar S. Baweja - Health Canada**
16:00		*Radon – Québec Situation* **Michel Deschamps - Radioprotection Inc.**	*50th anniversary of McMaster Research reactor* **Dave Tucker – McMaster-University**
16:30		***Meeting CRPA (R) members*** ***Room : Auditorium***	
18 :00		***Notre-Dame Hospital's Radiation Oncology Department Visit*** **Lysanne Normandeau et Aimée Lauzon** **CHUM** ***Les Terrasses***	

Scientific Poster Session : Les Terrasses.

ACRP/CRPA – CRSO 2009

Title :A Radiation Management System - An Integrated Approach	
Author(s) : Lois Sowden-Plunkett	
Speaker(s) :Lois Sowden-Plunkett	Email:lsowden@uottawa.ca
Employer : University of Ottawa	Session : Academic

Summary :A Corporate Perspective

One of the greatest challenges a Radiation Safety Professional has is to communicate a very technical and much regulated subject to senior management in order to obtain their support. Inherently, the Radiation Safety Program is often seen as a task driven program, rather than a management system which is critical to demonstrating corporate governance. This presentation portrays how Radiation Safety Program elements can be portrayed within a governance framework (Radiation Management System). The integrity of this system is based upon both the integration of each key element, as well as their interdependency. Although each element (corporate and operational) may be integrated, it is comprised of independent components, which can be modified and enhanced without disrupting the smooth operations of the whole system. This creates a management approach, which is both resilient and sustainable. The key elements of a Radiation Management system are:

1. Accountability/Responsibility Framework
2. Communication / Education
3. Compliance and Monitoring Activities
4. Documentation and Data Management, and
5. Security

This system ensures that the regulatory and university requirements are communicated, monitored and complied with by all parties.

ACRP/CRPA – CRSO 2009

Title :Feasibility studies for in vivo nitrogen measurements using prompt gamma neutron activation analysis at McMaster University	
Author(s) : Chantal Green	
Speaker(s) :Chantal Green	Email:cgreen@nwmo.ca
Employer : McMaster University	Session : Academic

Summary :The goal of this project was to determine the feasibility of measuring in vivo nitrogen using a prompt-gamma neutron activation analysis detection system at McMaster University. In the first stages of the research, the neutron field produced by a collimated PuBe source was characterized using a BF3 detector. It was found that graphite reflectors placed behind the phantom on the collimator's axis increased the thermal neutron flux by (15.0□0.6)%.

Two detectors were used to detect the 10.83 MeV photons from 14N(n, γ)15N reaction: a 5″×5″ NaI(Tl) detector and a 58mm diameter ×57 mm length HPGe detector with 35% efficiency relative to a 3″ ×3″ NaI(Tl) detector. The best configuration for each detector was found by calculating the net counts and the relative error. After noticing a smaller number of total counts for the nitrogen containing phantoms, it was determined that nitrogen caused a thermal flux suppression. In order to quantify this suppression, hydrogen was used as a standard to normalize the nitrogen-containing spectra and the nitrogen-free spectra. Despite the results of the BF3 measurements, the graphite reflectors did not improve the signal.

For both detectors, the source position, the irradiation time and the phantom volume were varied to quantify the effect on the signal. The detection limit for the NaI(Tl) system was (0.710±0.009)% and (1.10±0.02)% for the HPGe system. The lowest relative error achieved for a 2000s irradiation time of a phantom with a tissue-equivalent concentration was 10.4% for the NaI(Tl) system and 15.7% for the HPGe system. The dose accrued for an irradiation of this length was 0.33mSv.

ACRP/CRPA – CRSO 2009

Title :The World at Your Finger Tips - A Radiation Safety Program Made Easy	
Author(s) : Lois Sowden-Plunkett	
Speaker(s) :Lois Sowden-Plunkett	Email:lsowden@uottawa.ca
Employer : University of Ottawa	Session : Academic

Summary :An Operational Perspective

This presentation will demonstrate how you can keep your finger on the pulse of all your compliance activities and associated records without going crazy. Inherently it seems that for every action taken in radiation safety, there is some regulation or document that accompanies it. The trick is to be able to find a means of managing the workload, referencing regulations, documenting actions and then filing the record so that you or someone else can find it in a year, 2 or even 20 years. (Yes, I have revisited the 1960's.) By using the Microsoft Excel platform and a variety of worksheets you can easily track your key radiation safety program elements and associated activities, your documentation management system, chronological records (past, present & future), policies and procedures, compliance requirements and finally pertinent acts and regulations. This presentation will demonstrate the rationale behind the development of this system and key components of it.

ACRP/CRPA – CRSO 2009

Title :Towards Improving the detection limit of electron paramagnetic resonance (EPR) dosimetry of drywall (wallboard)	
Author(s) : Raj Mistry1, Jeroen W. Thompson1, W. Jack Rink2, Doug Boreham1	
Speaker(s) :Raj Mistry	Email: mistryrr@univmail.cis.mcmaster.ca
Employer : McMaster University	Session : Academic
Summary :The intensity of the electron paramagnetic resonance (EPR) line corresponding to the carbonate free radical (CO_3^-) in gypsum ($CaSO_4 \cdot 2H_2O$) drywall was previously shown to be proportional to absorbed dose. Heating irradiated drywall reduces the radiosensitive signal of the CO_3^- radical. The response of the CO_3^- EPR line to heat treatments is being studied in order to determine a background for an arbitrary drywall sample. Ultimately this is expected to improve the precision of dose measurements with drywall and to reduce the detection limit. Controlled heating of irradiated drywall was performed at temperatures between 50° C and 100° C. Although higher temperatures reduce the radiosensitive signal rapidly, the non-radiosensitive EPR signals are affected dramatically as well, presumably due to a phrase change from gypsum to plaster of Paris to anhydrite.	

ACRP/CRPA – CRSO 2009

Title : Rebuilding a Radiation Safety Program: the Road to Success	
Author(s) : Marie Leclerc	
Speaker(s) : Marie Leclerc	Email: leclerc.m@uquam.ca
Employer : UQAM	Session : Academic
Summary : In 2005, the CNSC notified UQAM's upper management of its concerns with respect to the institution's radiation safety program. Indeed, there were many program deficiencies that could have compromised the health and safety of users and members of the public. This presentation will stress the methods and efforts required to consolidate the radiation safety program, as well as the importance of engaging all stakeholders to ensure sustainability at a level of excellence.	

ACRP/CRPA – CRSO 2009

Title :Radiofrequency Radiation Bioeffects Research	
Author(s) : Scott Nichelson	
Speaker(s) :Scott Nichelson	Email:Scott.Nichelson@brooks.af.mil
Employer : US Air Force	Session : Non-ionizing
Summary :The author will provide an overview of the Radio Frequency Radiation Branch, Directed Energy Bioeffects Division, Human Effectiveness Directorate of the Air Force Research Laboratory. He will discuss the organization and mission of the Branch, and provide a general overview of types of research projects the branch is involved with. The branch is divided into three different areas: basic research, applied research, and operations. The author will provide an overview of each of these three different sections. The talk will conclude by briefly discussing the active denial system and the Branch's on-going collaborations.	

ACRP/CRPA – CRSO 2009

Title : Mobile Phones : A Review	
Author(s) : Jean-Philippe Gariépy, Audrey Roux	
Speaker(s) : Jean-Philippe Gariépy	Email: jean-philippe.gariepy@umontreal.ca
Employer : Student at Centre hospitalier de l'Université de Montréal (CHUM)	Session : Non-Ionizing
Summary : The use of cellular phones has known an uninterrupted growth over the last few years. A recent United Nations report estimated that there are currently 4 billion mobile cellular subscriptions, which represents a huge increase compared to one billion estimated in 2002. However, this popularity has been accompanied by growing concerns of the public and scientific community about potential harmful effects that exposure to radiofrequency radiation emitted by mobile phones and base stations may have on human health. Many people are concerned that the use of a mobile phone could cause headaches, insomnia and certain types of brain cancer. A large number of studies were published on the subject. We propose a review of those studies in order to clarify the current state of the situation.	

ACRP/CRPA – CRSO 2009

Title :New reactor design features to improve radiation safety performance	
Author(s) : Jag Mohindra	
Speaker(s) :Jag Mohindra	Email:jag.mohindra@gmail.com
Employer : Jag Mohindra Consulting Services	Session : Nuclear

Summary :To achieve an effective radiation protection program performance requires a combination of good design, high quality construction and proper operation. To optimize a design requires a structured approach in decision making to control radiation doses. Any process used to assess or review design must demonstrate that a balance is achieved between safety and cost. Such a design is optimum and cost effective for the entire life cycle of a nuclear power plant. New nuclear reactor design management process integrates the application of ALARA principles at all phases of a project evolution from conceptual design phase to the entire life cycle of the plant. The new reactor design features are analyzed to meet the stringent design targets to ensure that occupational and public radiation exposures are ALARA, and waste production is controlled close to the source of origin and minimized. This paper will discuss the structured approach used to improve radiation safety at all stages from operation and decommissioning. The discussion will include examples to optimize safety decisions by integrating with the life cycle functions of an engineering system such as radiological source term reduction, equipment lay out, management of the high radiation areas, and better use of instrument and control to monitor change in hazard levels.

ACRP/CRPA – CRSO 2009

Title : Dosimetry of the Staff at Gentilly II Nuclear Plan	
Author(s) : Djamel Cherouati et Eric Dion	
Speaker(s) : Djamel Cherouati	Email: cherouati.djamel-eddine@hydro.qc.ca
Employer : Hydro-Québec	Session : Nuclear
Summary :	

ACRP/CRPA – CRSO 2009

Title :Uranium Exploration and Human Health Protection in Canada	
Author(s) : Anar S. Baweja, Bliss L. Tracy	
Speaker(s) :Anar S. Baweja	Email:anar_baweja@hc-sc.gc.ca
Employer : Health Canada	Session : Nuclear
Summary :Canada is in the midst of a world-wide nuclear renaissance. Presently, commercial nuclear reactors in Canada produce approximately 15% of the countryâ€™s electricity needs. Up to eight new reactors are in the planning stage to meet future electricity needs. This will require additional uranium to fuel the new reactors; hence exploration for uranium has increased significantly. In Canada, uranium exploration is a provincial/territorial responsibility under the mining acts. However, once a decision is made to mine the uranium deposit, then it becomes a federal responsibility under the Nuclear Safety & Control Act. Under this Act, the federal agency - Canadian Nuclear Safety Commission - regulates the mining, processing and transport of uranium in Canada. Generally, the public perceives uranium exploration to be dangerous to human health and the environment. Health Canadaâ€™s mandate is to protect the health of all Canadians from undue exposure to contaminants, including the radiation exposure. In order to meet its statutory responsibilities, Health Canada undertakes research & development activities to formulate policies and strategies. In addition, Health Canada develops guidelines to deal with the exposure hazards. At this meeting, uranium exploration and the strategies to protect human health will be presented and discussed.	

ACRP/CRPA – CRSO 2009

Title : Radon : The situation in Quebec	
Author(s) : Michel Deschamps	
Speaker(s) : Michel Deschamps	Email: mdeschamps@radioprotection.qc.ca
Employer : Radioprotection Inc.	Session : Academic
Summary :	

ACRP/CRPA – CRSO 2009

Title : 50th anniversary of McMaster Research reactor	
Author(s) : Dave Tucker	
Speaker(s) : Dave Tucker	Email:
Employer : McMaster University	Session : Training
Summary :	

		WEDNESDAY	
7:00		**CRPA–R Exam Coaching**	
7:30		Room: St-Charles	
8:00		**REGISTRATION**	
		Room : AUDITORIUM	
8:30	**Session 5**	***Safety Management – Different Perspectives*** **Tania Hewitt - CNSC**	
9:00		***Designing and implementing a bioassay program*** **Julie Burtt - CNSC**	
9 :30		***Dose Estimations for Nuclear Medicine Rooms – Design by ALARA*** **Melissa Fabian - CNSC**	
10 :00		**Coffee Break with our vendors**	
		Room : AUDITORIUM	Room: ST-CHARLES
10 :30		***Safety Code 35: Safety Procedures for the Installation, Use and Control of X-ray Equipment in Large Medical Radiological Facilities*** **Narine Martel - Health Canada**	**Liquid Scintillation Training** **Wally Martinew – Beckman-Coulter**
11:00		***Summary of the Federal Provincial Territorial Radiation Protection Committee (FPTRPC) 2008 Meetings:*** **Gary Hughes - Alberta Employment and Immigration**	
11:30		***CRPA Participation in the Development of CSA Nuclear Standards*** **Mike Grey - Candesco**	
12:00		**Lunch-Free time**	
12:30			

ACRP/CRPA – CRSO 2009

Title :Safety Management - Different Perspectives	
Author(s) : Tanya Hewitt	
Speaker(s) :Tanya Hewitt	Email:tanya.hewitt@cnsc-ccsn.gc.ca
Employer : Canadian Nuclear Safety Commission	Session : Academic
Summary :Safety is easily defined, right? If there have been no accidents, people do what they are told, machines are within spec, then we will be accident free … is there anything wrong with this perspective? Well, according to many of the speakers I have heard and the papers I have read due to my involvement with an organization called the System Safety Society – there IS a problem with this perspective. This talk will be an overview of what I have learned since my involvement with this society, and will hopefully inspire you to look outside the domain of radiation safety to learn that other safety oriented domains have valuable lessons to share on theories of accident causation, human - machine interactions and thoughts on what it means to have a "safe" system. References to original material included!	

ACRP/CRPA – CRSO 2009

Title :Designing and implementing a bioassay program	
Author(s) : Julie Burtt	
Speaker(s) :Julie Burtt	Email:Julie.burtt@cnsc-ccsn.gc.ca
Employer : CNSC	Session : Regulatory
Summary :In accordance with the Nuclear Safety and Control Act (NSCA, the Act) and the regulations made under the Act, all Canadian Nuclear Safety Commission (CNSC) licensees must ascertain their worker's dose. Ascertaining dose can be performed by several means and must be appropriate for each job function, taking into account the type of radioactive material handled and the frequency at which workers are monitored. A bioassay monitoring program ensures the safety of workers and assesses a worker's body burden from exposure to radionuclides. CNSC staff has developed a draft regulatory document detailing the appropriate type, method, and frequency of bioassays for specific working conditions. The draft regulatory document "Designing and implementing a bioassay program" describes the criteria for participation in a bioassay program, the frequency of monitoring, and the actions taken on the basis of measurement results. Four types of monitoring programs are described in the document: baseline bioassay assessment, routine bioassay monitoring, special bioassay monitoring, and confirmatory monitoring. The document also suggests methods of interpreting and recording results. In the presentation, an overview of the regulatory document will be provided, including details on the different monitoring programs and their practical application in the work place.	

ACRP/CRPA – CRSO 2009

Title :Dose Estimations for Nuclear Medicine Rooms – Design by ALARA	
Author(s) : Melissa Fabian	
Speaker(s) :Melissa Fabian	Email:melissa.fabian@cnsc-ccsn.gc.ca
Employer : CNSC	Session : Regulatory
Summary :As part of licensing, CNSC staff assess and approve the design submission for new or renovated Nuclear Medicine rooms and nuclear substance laboratories. The draft regulatory document RD-52 outlines the licensing process, and details an approach for submitting the design document to the CNSC. At the planning and design stage, the predicted doses to workers and members of the public should be a prime consideration. This presentation provides a suggested method for calculating dose estimates using a five step approach. The five steps include: obtaining an accurate facility layout, identifying locations of radiation sources and workload for each location, identifying occupied locations while sources are in use, estimating radiation dose rates to the occupied areas from sources and extrapolating dose rates to annual doses of persons occupying those areas. This approach for calculating dose estimates is discussed in detail using a worked example to illustrate the overall method.	

ACRP/CRPA – CRSO 2009

Title :Safety Code 35 - Radiation Protection in Large Medical Radiological Facilities	
Author(s) : Narine Martel	
Speaker(s) :Narine Martel	Email:Narine_Martel@hc-sc.gc.ca
Employer : Health Canada	Session : Academic
Summary :Health Canada recently published Safety Code 35 entitled "Radiation Protection in Large Radiological Facilities". This Safety Code was prepared to provide guidance to large radiological facilities where diagnostic and interventional radiological procedures are routinely performed using radiographic, radioscopic or computed tomography equipment. The presentation will provide an overview of Safety Code 35. Information will be presented on personnel qualifications and responsibilities, procedures for minimizing radiation exposures to personnel and patients, facility and equipment requirements, and quality assurance programmes and quality control testing.	

ACRP/CRPA – CRSO 2009

Title :Summary of the Federal Provincial Territorial Radiation Protection Committee (FPTRPC) 2008 Meetings	
Author(s) : Gary W. Hughes	
Speaker(s) :Gary W. Hughes	Email:gary.hughes@gov.ab.ca
Employer : Alberta Employment and Immigration	Session : Regulatory
Summary :The Federal Provincial Territorial Radiation Protection Committee (FPTRPC) meets annually to discuss emerging issues in radiation protection, review the progress of working groups over the past year, and set priorities for the coming year. This presentation provides background information on the FPTRPC, its history, mandate and terms of reference. The Committee's business activities are discussed with emphasis on the proceedings from our November 2008 annual meeting: the activities of the various working groups and presentations of general interest in radiation health and safety.	

ACRP/CRPA – CRSO 2009

Title :CRPA Participation in the Development of CSA Nuclear Standards	
Author(s) : Michael G. Grey	
Speaker(s) :Michael G. Grey	Email: mgrey@candesco.com
Employer : Candesco	Session : Regulatory

Summary :There has been revival of nuclear standards development by the CSA in recent years. This is partly due to a need for new or updated standards to support 'new build' and partly due to a recognition by both regulators and licensees that a cooperative approach to standards development has advantages for both groups.

Work on CSA nuclear standards is guided by the Nuclear Strategic Steering Committee which has grouped the standards into five program areas:

- Radioactivity Management;
- Quality Assurance & Management Systems;
- Pressure Retaining Systems & Components;
- Safety Related Systems; and
- Structural Requirements.

Responsibility for standards in each of these areas is assigned to one or more 'Technical Committees' which are usually composed of members from five groups: Government Regulator; Owner/Operator; Supplier/Fabricator; Service Industry and General Interest. The CRPA is a 'General Interest' member of the three CSA Technical Committees within the 'Radioactivity Management' program area. The recent activities of each of these Technical Committees are summarized below.

Radiological Protection of the Environment (N288)

- Work on a revision of CAN/CSA-N288.4 (Guidelines for Radiological Monitoring of the Environment) is nearing completion, publication is scheduled for 2010; and
- Work has just begun on a new N288.5 (Guidelines for Effluent Monitoring) Standard.

Radioactive Waste Management (N292)

- A new N292.3 (Management of Low- and Intermediate-Level Radioactive Waste) Standard has been published; and
- Work has begun on a new N292.5 (Guidelines for the Application of Clearance of Materials from Regulatory Control).

Decommissioning (N294)

- A new N294 (Decommissioning of Nuclear Facilities) Standard has completed industry & public review and is being prepared for final approval.

		Room : AUDITORIUM	Room: ST-CHARLES
13:00	**Session 6**	***ALARA-CAD: A Radiation Facility Shielding Design Software Tool*** **Maggie Kusano - Sunnybrooke Health Sciences Centre**	***On-going Maintenance and Challenges of Refresher Training in WebCT at UWO*** **Hoa Ly - U of Western Ontario**
13:30		***Putting Protons in a Hospital*** **Marcum Matz – Medical College of Wisconsin**	***Radiation Hazard Assessments in a University Setting*** **Sandu Sonoc – University of Toronto**
14:00		***Performance Indicator in Radiation Protection*** **Michèle Légaré – Ottawa Hospital's**	***Current status of Medical and health Physics education program at McMaster*** **Dave Tucker – McMaster University**
14:30		***Environmental Protection*** **Tamara Yankovich Ecometrix Inc.**	
15:00		**Coffee Break**	
15:30		**ANNUAL GENERAL MEETING-CRPA AUDITORIUM**	
16:00			
16:30			
17:00			
17:30			
18:00		**AWARD Presentation- CRPA** TERRASSE	
19:00		**CRPA BANQUET** Restaurant le Tour de Ville	

Scientific Poster Session : Les Terrasses.

CRSO 2009

Title :ALARA-CAD: A Radiation Facility Shielding Design Software Tool	
Author(s) : Maggie Kusano, Curtis Caldwell and Ian Ferenci	
Speaker(s) :Maggie Kusano	Email:mkusano@sri.utoronto.ca
Employer : Imaging Research, Sunnybrook Health Sciences Centre; - Departments of Medical Physics and Medical Biophysics, Sunnybrook Health Sciences Centre; - ALARAWARE	Session : Medical

Summary :

Introduction: The goals of facility shielding design are to meet local regulatory requirements and to keep radiation exposures and doses to workers and the public As Low As Reasonably Achievable (ALARA). Shielding design is an iterative process that involves calculation of doses to occupants of a facility and surroundings based on projected layouts, protocols and workflows, and reduction of doses to ALARA through adjustment of aforementioned parameters and introduction of attenuating media. This can be time-consuming, requiring several cycles of meetings, manual ruler measurements and spreadsheet data entry, as layouts, workflows and shielding structures are adjusted to not only meet radiation protection standards, but architectural, engineering, user and budget requirements as well. Educated assumptions and simplifications are often made to reduce calculation burden. For example, one may estimate the maximum dose to an occupant of a room by performing calculations at a single point where dose is expected to be greatest. In such cases, results are highly dependent on one's ability to predict these points of maximum dose, which can be difficult when several sources and shields are involved.

Method: ALARA-CAD is a software tool that was developed to automate the design process, eliminating the need for rulers and spreadsheets. It reads floor plan images on which users can locate and describe facility features such as radiation sources (e.g., devices or radionuclides and activities, times, studies/year); shielding structures (e.g., materials, dimensions); and regional occupancy factors through its computer-aided design- (CAD-) like interface. Using methods and data recommended by the CNSC, NCRP and AAPM, the program calculates dose at all points on the floor plan and the floors above and below. Results are displayed as scaled dose map overlay images that allow visualization of dose distribution about the facility and its surroundings. Sources, shields and other inputs can be adjusted and doses recalculated and redisplayed until ALARA values are achieved. Designs, including dose maps, shielding layouts, and tables containing source descriptions, shielding specifications and sample point dose calculations, can be exported for regulatory report documentation.

Results: ALARA-CAD has successfully reproduced the results of dose estimate and shielding design examples published by the CNSC, NCRP and AAPM. The program has been used for the design and licensing of nine facilities, including PET, conventional nuclear medicine and industrial isotope imaging installations. The speed of the program allowed for the evaluation of multiple scenarios in relatively little time, promoting more thorough, comprehensive and cost-effective designs. The dose map visualization unique to ALARA-CAD proved invaluable for locating high-dose areas, especially on the floors above and below the facility, which may have

been missed with conventional point calculation methods. Dose maps were also helpful in illustrating the need for structural and workflow modifications to architects, engineers and facility staff.
Conclusions: ALARA-CAD can improve the speed, safety, thoroughness and comprehensibility of radiation facility shielding design. Future work includes comparison of results to Monte Carlo simulations and post-installation measurements, and development of new modules for additional radiation shielding applications.

ACRP/CRPA – CRSO 2009

Title :On-going Maintenance and Challenges of Refresher Training in WebCT at UWO	
Author(s) : Hoa Ly, Brittany Bryans and Vivi Nguyen	
Speaker(s) :Hoa Ly	Email:hly@uwo.ca
Employer : University of Western Ontario	Session : Training
Summary :Every radiation permit holder and authorized nuclear substance /radiation device user at the University of Western Ontario (UWO) is required to take radiation safety refresher training every two years in webCT which is offered 24 hours a day, 7days a week. The refresher training has been successful since 2004 and UWO has received positive comments from the CNSC inspectors. The successful refresher training involves on-going maintenance and challenges including: updating the course content due to changes in regulations and feedback from the users, computer technology, user IDs, e-mail addresses, friendly reminders, completion notification and the last training date of authorized users listed on the posted radiation permit.	

ACRP/CRPA – CRSO 2009

Title :Putting Protons in a Hospital	
Author(s) : Marcum Martz	
Speaker(s) :Marcum Martz	Email:mmartz@mcw.edu
Employer : Medical College of Wisconsin	Session : Medical
Summary :With the proliferation of proton therapy, traditional medical institutions are looking to put high-energy proton accelerators into hospital or clinic settings. This presentation explores the challenges of designing shielding for equipment that may be still in the design phase for a facility with aggressive time constraints. The similarities and differences between conventional radiotherapy and proton therapy are discussed from the perspectives of health physics and regulatory compliance.	

ACRP/CRPA – CRSO 2009

Title : Radiation Hazard Assessments in a University Setting	
Author(s) : Sandu Sonoc, Hector Rocca	
Speaker(s) : Sandu Sonoc	Email: sandu.sonoc@utoronto.ca
Employer : University of Toronto	Session : Training

Handling small amounts of radioactive materials everyday leads many users and radiation safety officers to underestimate the radiation hazards in a university setting. New studies [1] show that a spill on the skin of 1 MBq (27 microCi) of a high energy beta emitter (P-32 or Y-90) can give a dose of 1 or 2 Sv/hr. Also the synergetic effects of different hazards are not well understood and sometimes forgotten. A documented formal hazard assessment is now a requirement in many countries [2].

Any hazard assessment must take into consideration the following three factors:

- The potential of hazardous materials or systems to cause injury,
- The experimental setting, and
- The human factor (experience, qualifications, training, maturity, etc.)

In this paper the following aspects of the hazard assessment in radiation safety are covered:

- Use of radioactive materials and their interactions with other types of hazardous materials (biological or chemical)
- Use of radiation devices including x-ray machines
- Use of lasers
- Use of UV lights
- Use of EMF

We will present the forms and methods used in our university to document hazard assessment in radiation protection.

[1] ICRP Publication 106 – Radiation Dose to Patients from Radiopharmaceuticals, Volume 38, Nos. 1-2 2008

[2] Tom Cherrett, James C. Gates, etc. – Making Laser Safety Training More Cognitively Effective: Making Training Videos Interactive and Adaptive, International Laser Safety Conference ILSC 2009, March 23-26, 2009, Reno, Nevada, USA

ACRP/CRPA – CRSO 2009

Title :Radiation Safety Quality Performance Indicators	
Author(s) : Michèle Légaré-Vézina, Nadia Zaid	
Speaker(s) :Michèle Légaré-Vézina and Nadia Zaid	Email:mlegare@toh.on.ca
Employer : The Ottawa Hospital	Session : Medical

Summary :Radiation Safety Quality Performance Indicators

The goal of The Ottawa Hospital is to become a top 10 % performer in quality and safety of patient care in North America. The strategy is to create a culture of quality and safety with clear performance measures, targets and outcomes. This presentation will highlights the links between radiation safety performance indicators and TOH quality indicators. The indicators selected with targets and outcomes will be presented. The methodology used to quantify inspection results and select targets will be explained. Performance indicators offer clear benefits and provide insight and direction in focusing on going quality improvement initiatives and resources.

ACRP/CRPA – CRSO 2009

Title : Current status of Medical and health Physics education program at McMaster	
Author(s) : Dave Tucker	
Speaker(s) :Dave Tucker	Email:
Employer : McMaster University	Session : Training
Summary :	

ACRP/CRPA – CRSO 2009

Title : Environmental Protection	
Author(s) : Tamara Yankovich	
Speaker(s) : Tamara Yankovich	Email: tyankovich@ecometrix.ca
Employer : EcoMetrix	Session : Environmental Health Physics

Summary : There has been a major push during the last 10 years to demonstrate environmental radiological protection, with EU, USA, and Canada leading the way. It is still a work in progress. ICRP and IAEA are presently preparing key documents that hope to capture the present achievements and provide further direction.

IAEA is presently engaged in the process of revising the Basic Safety Standard (BSS) 115. The initial plan was to include the environmental protection in this document. It was subsequently decided to include only a brief statement of principle, and collect all the material pertaining to environmental protection in a separate document, in the form of a Safety Guide. This document aims to provide a practical guidance to everyone concerned with demonstrating environmental protection. Clear guidance is essential for streamlining the environmental assessment process.

Tamara Yankovich is a member of a consultancy committee tasked by the IAEA of providing the Safety Guide draft. Hence, she is uniquely placed to influence the content of the proposed Safety Guide by providing a clear Canadian view on this topic. She is presently engaged in collecting the views of the interested Canadian parties. A CNA organized workshop was held on May 14 in Toronto, providing the first draft of a wish list, upon which one may like to expand. New ideas are welcome.

		THURSDAY	
7:00		**Coaching: CRPA-R Radiation Safety**	
7:30		Room: St-Charles	
8:00		**REGISTRATION**	
		Room: AUDITORIUM	
8:30	**Session 7**	***Portal Monitoring: Methodology for Increasing Throughput*** **Gary Kramer-Health Canada**	
9:00		***International Internal Dosimetry network.*** **Gary Kramer-Health Canada**	
9:30		***Fire Safety Considerations during Decommissioning of a Research Reactor*** **Ray Ilson-Dalhousie University**	
10:00		**Pause café**	
10:30		***Radiation Safety Aspects of Recovery after a Fire in a University Research Facility*** **Eva Sailerova & Leona Page –University of Manitoba**	
11:00		***A Report from the CRTI Workshop on Emergency Preparedness for Vulnerable Population Groups*** **Jing Chen- Health Canada**	
11:30		**CONFERENCE CLOSING**	
12:00			
12:30			
		Room: VERSAILLES	Room: ST-CHARLES
13:00		**Transport Dangerous Goods-Ground Refrehsher Class 6 and 7** Pierre Boyer - Edumax	**Operational Health Physics & Radiological Engineering Course on Principles and Applications** Jag Mohindra - Consultant
13:30	**Continuing Education**		
14:00			
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16:30			
17:00			

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Title :Portal Monitoring: Methodology for Increasing Throughput	
Author(s) : Gary H. Kramer, Kevin Capello, Barry Hauck, Gerry Moodie, Anthony DiNardo, Linda Burns, Albert Chiang, Leonora Marro, and Jason Brown	
Speaker(s) :Gary H. Kramer	Email:gary_h_kramer@hc-sc.gc.ca
Employer : Health Canada	Session : Academic
Summary :The National Internal Radiation Assessment Section (NIRAS), which operates the Canadian National Calibration Reference Centre for Bioassay and In Vivo Monitoring, has field deployable equipment for emergency response. A substantial part of this toolkit is a set of portal monitors that can be used to quickly screen people into the "uncontaminated" and the "contaminated". The former term refers to a person who has less than 60 kBq of activation/fission products and the latter group are contaminated by that amount or more. Recent field work has shown that one type of the NIRAS's portal monitors can be alarmed at significant distan! ces if the level of contamination is high enough. The other types, which do not initiate a count until either an infra-red beam is broken or a proximity detector is activated, do not alarm but their background will be raised and this causes other problems. This paper proposes a method of group monitoring to help speed up the process of screening a large number of potentially contaminated persons using portal monitors. In short, the group of potentially contaminated persons will be kept remote from the portal stations. Depending on a real-time estimate of the percentage of contaminated persons in the crowd, groups of persons will be selected for screening. The hypergeometric distribution has been used to decide on the sampling group size with an expectation that 90% of the time no contaminated person will be present in the group. Once removed from the main waiting area, the group will be pre-screened and then, depending on the result, sent to the appropriate portal. It! is anticipated that this will greatly speed up processing as it substantially reduces the transit time. Transits times have also been estimated in addition to the number of personnel required to run all of NIRAS's field deployable equipment.	

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Title :International Internal Dosimetry network.	
Author(s) : Gary H. Kramer	
Speaker(s) :Gary H. Kramer	Email:gary_h_kramer@hc-sc.gc.ca
Employer : Health Canada	Session : Academic

Summary :The idea for the International Internal Dosimetry Network came out of discussions held at the World Health Organization's (WHO) Radiation Emergency Medical Preparedness and Assistance Network (REMPAN) meeting that was held in Buenos Aires, Argentina, 15th - 17th October 2008. It was recognised that the surge capacity of many countries may be insufficient to deal with an incident, accidental or intentional, that contaminates a large number of people. It was thought that if a network on Internal Dosimetrists were available, then this could go a long way to alleviating the problem, and help in assessing health risks quickly so that further action could be taken, if required. Setting up such a network, electronically, would require a host organization to step forward to dedicate resources and server space. Judging by the author's host organization, getting approvals might be lengthy, so a different approach was chosen to demonstrate the effectiveness (or lack of) for such a network. While it is true that some regions of the world are better resourced than others (e.g., USA, Europe - through EURADOS) many countries simply do not have the resource depth required to deal with a serious radiological emergency that may have been caused either intentionally, or accidentally. Canada falls into this category. A prototype network has been established using tools available on the internet. This innovative approach avoids dependence on a host organisation providing resources, avoids a lengthy approval process, and is cost neutral to all participants. The Network is being promoted as a resources for Internal Dosimetrists who wish to: - Establish scientific cooperation and inter-institutional relationships. - Foster and promote the exchange ideas/techniques. - Collaborate on research and development in the field of Internal Dosimetry. - Identify regional experts in Internal Dosimetry. - Generally broaden the scientific experience of all parties. - Provide a forum for discussion of issues relating to Internal Dosimetry. - Identify resources that can be called upon to assist when respond to incident that overwhelm the user's host institution etc. The Network was established on 22 Jan 2009 and e-mail notifications were sent to a limited numbers of persons. Five days post-establishments the Network had 45 members, worldwide. Advertising is still continuing and it hoped that the network will grow through this, and through word of mouth recommendations. This presentation will provide the details of the Network, how to join it, and give its latest status.

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Title : Fire Safety Considerations during Decommissioning of a Research Reactor	
Author(s) : Stephen Ellis, Martin Gillis, Pauline Jones, Raymond Ilson	
Speaker(s) : Raymond Ilson	Email: raymond.ilson@DAL.CA
Employer : Dalhousie University	Session : Emergency

Summary : Generally research reactor facilities do not contain much combustible material, so the risk of fire is low. The building, pool, and pool covers are made of solid concrete. Due to its physical structures and location underground, these Facilities are constructed of several concrete walls and fire separation barriers. Backup power supply is available. The facilities are equipped with fire alarms, extinguishers and sprinkler systems. The alarm systems and fire extinguishers are tested on a regular basis.

However, while the risk is low, the potential impact is high. To address this issue, a strong relationship is also maintained with the Fire Marshall and the Halifax Regional Municipality Fire Department. The Department sends the Fire Marshall and several crews to the facility on an annual basis for orientation and inspection. In addition, the University holds annual fire drills under the coordination of the Office of Environmental Health and Safety.

Potential sources of ignition sources and fuel such as propane systems or flammable gases will be disconnected in reactor rooms during the de-fueling and reactor dismantling. If heavy-duty forklifts, producing significant amounts of smoke, will be used during the removal of biological shields, fuel flask or reactor components, the fire alarm system will be temporarily disconnected.

The Emergency Response Plan will consider on-site emergencies as well as transport concerns. The Plan will be reviewed and updated, with the co-operation of local emergency services, including the trauma unit at nearby medical facilities. Should an emergency situation arise, pre-planning will facilitate the response of local security forces, fire departments and emergency medical services. Emergency command centres and control zones will be established, and will be supplied in advance with communications, pre-determined emergency response plans and supplies and equipment sufficient to deal with a possibly prolonged emergency situation.

Exercises will be established and practiced in preparation for possible emergency situations. These exercises will demonstrate the ability to respond to an emergency, identify any weaknesses or problems with the emergency plan and provide practice to participants.

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Title :Radiation Safety Aspects of Recovery after a Fire in a University Research Facility	
Author(s) : Leona Page, Eva Sailerova	
Speaker(s) :Eva Sailerova & Leona Page	Email:Eva_Sailerova@umanitoba.ca
Employer : University of Manitoba	Session : Emergency
Summary :On Saturday, March 28, 2009, a major fire occurred in a University of Manitoba research facility impacting on active radioisotope laboratories. The good news was that there were no injuries and no lives lost. On a darker note, decades of research were lost, graduate and undergraduate students have had their work disrupted and costs will be in the millions of dollars. Radiation safety staff responded urgently to maintain control of the licensed radioactive material. Radiation safety staff was relied on to provide a radiation risk assessment and on-going radiation safety information to recovery workers. The lessons on preparedness, response and recovery are many. The recovery phase has been predicted to last months. Find out how we were able to rely on the relationships built and preparedness developed from past emergency response exercises to maintain effective radiation safety during the recovery phase.	

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Title :A Report from the CRTI Workshop on Emergency Preparedness for Vulnerable Population Groups	
Author(s) : Jing Chen(1), Diana Wilkinson(2), Richard Richardson(3), Barbara Waruszynski(2)	
Speaker(s) :Jing Chen	Email:Jing_Chen@hc-sc.gc.ca
Employer : (1): Radiation Protection Bureau, Health Canada, Ottawa (2): Defence Research and Development Canada, Ottawa (3): Atomic Energy of Canada Limited, Chalk River	Session : Emergency
Summary : The Chemical, Biological, Radiological-Nuclear, and Explosives (CBRNE) Research and Technology Initiative (CRTI) is part of Canada's response, helping to sharpen the focus of our scientific and security communities on the areas that are the most relevant to today's realities. Many previous and ongoing CRTI projects have greatly strengthened Canada's preparedness for CBRNE events. However, there is a need to increase the preparedness for dealing with vulnerable population groups, such as children, elder citizens, and persons of special medical needs. The CRTI Workshop on Emergency Preparedness for Vulnerable Population Groups was held March 2nd and 3rd 2009 in Ottawa, Canada. Its purpose was to enhance communications within the emergency community response network, identify the needs and gaps of emergency preparedness against CBRNE events for vulnerable population groups, and eventually generate a plan for the development of emergency casualty management capabilities for these groups. Through several round table discussions during the two days, all attendees actively participated in answering several key questions, such as who are the vulnerable population groups for the purpose of emergency preparedness planning; what are special emergency preparedness considerations that may affect these groups; which emergency preparedness activities would be required to adequately deal with the identified considerations. In addition, they provided recommendations on how to best acquire the information and capability considered as missing or a gap in addressing the needs of vulnerable groups. Results of the round table discussions are summarized here.	

		FRIDAY	
7:00			
7:30			
8:00		Operational Health Physics & Radiological Engineering Course on Principles and Applications Jag Mohindra-Consultant Room: ST-CHARLES	
8:30			
9:00			CERTIFICATION EXAMINATION CRPA-R Room : VERSAILLES
9:30			
10:00			
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11:00			
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12:00		Lunch-Free Time	
12:30			
13:00		Operational Health Physics & Radiological Engineering Course on Principles and Applications Jag Mohindra-Consultant Room: ST-CHARLES	
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LIST OF EXHIBITORS

LIST OF ATTENDEES