AIR2
Access to INFRASTRUCTURES for Radiation protection Research

Issue 5
March 2016

Editorial

DoReMi has finally come to an end after six years of effort, during which so many paths were explored. Following publication of the HLEG recommendations, DoReMi was the first project to dedicate specific efforts to infrastructures. The major means to support infrastructure access in DoReMi has been through an extensive survey on available infrastructures, identification of gaps, and then financing access to specific infrastructures by providing funds for their upgrade and/or use, notably for low dose/low dose rate gamma irradiation and microbeam facilities as well as a retrospective radon dosimetry platform. All the information gathered for DoReMi will be transferred to CONCERT: http://www.concert-infrastructures.eu/.

Our thanks go to Sisko, Liisa and Noora for their efficient coordination and their immense patience.

Dr Laure Sabatier - CEA

The floor to...

Research Infrastructures: A way to optimize human and material resources

"Research Infrastructures" refers to facilities, resources and related services used by the scientific community to conduct top-level research. As a funding agency, the Agence Nationale de la Recherche, ANR (French National Research Funding Agency), encourages the use of research infrastructures, even though this is not an evaluation criteria in its 2016 Action Plan (www.anr.fr). Looking through the EJP CONCERT binocular, it is an obvious move to seek research infrastructures viewed as key instruments in the radioprotection landscape. As a European program aiming to strengthen a particular field, CONCERT has the obligation to provide strong support to these facilities, resources and related services that bring together a wide diversity of stakeholders to find solutions for radioprotection. Another important action that CONCERT is carrying out, consists of spreading information about research infrastructures and increasing awareness amongst the Member states and Associated Countries, including ethics and regulations within the framework of radioprotection. And overall, let's not lose track of the fact that research infrastructures and platforms are useful means to increase our efficiency in European Radioprotection instruments, which is CONCERT's duty as well.

In the CONCERT consortium, ANR is leader of WP4, for which the deliverables are calls for proposals. In this WP, ANR is working in close collaboration with the Portuguese Foundation for Science and Technology and the Swedish Radiation Safety Authority. CONCERT can be proud that its first call for proposals is ready to be announced, and hopefully will be launched very soon. This shows that CONCERT as a whole is very dynamic and deliverables-driven. It also shows that CONCERT is on the path to success. However, CONCERT still has a lot of work to achieve.

Radioprotection needs CONCERT consortium and research infrastructures but, above all, this field needs capacity building and a sharing of skills and competences of its researchers and managers. To see achievements in this field, human resources must have the appetite to drive its scientific community towards solutions.

Dr Guillaume Pons - ANR
CONCERT WP4 Leader
« Organization and management of CONCERT open RTD Calls »

Photo: © V. Briquet Laugier /ANR

CONCERT CORNER

Future events:

12 July 2016: ExB meeting, Brussels, Belgium

13 July 2016: MB meeting, Brussels, Belgium

20 Sept 2016: ExB meeting, Oxford, UK

23 Sept 2016: MB meeting, Oxford, UK

WP 6 News:

11 July 2016: "Harmonization and Exercise" presentation day, Brussels, Belgium

Sept 2016: Task 6.2 presentation day, Oxford, UK

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April 2016

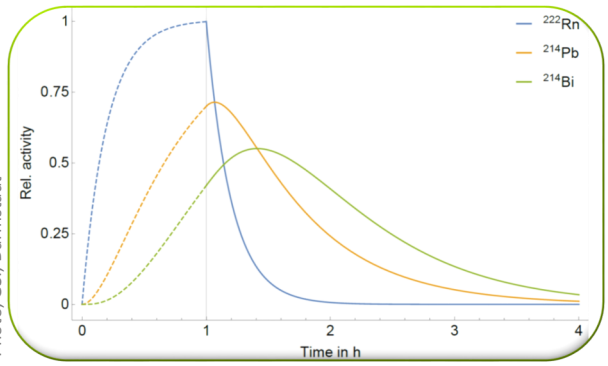
This project has received funding from the Euratom research and training programme 2014-2018 under grant agreement No 662287

Radon Exposure Chamber

Investigating anti-inflammatory effects of ionizing radiation

Radon is used in the treatment of chronic inflammatory diseases such as rheumatoid arthritis or ankylosing spondylitis. Patients are subjected to radon baths or inhalation therapies in radon galleries. Within the GREWIS project, eight scientific groups at GSI, TU Darmstadt and the Universities of Frankfurt and Erlangen are currently investigating the underlying physical and biochemical mechanisms and the genetic effects potentially linked to low dose radon exposure.

At GSI, a radon chamber was constructed to mimick stable radon gallery conditions and up to 15 times higher radon concentrations. The complete chamber is positioned in a radiologically controlled area. In adjacent biological laboratories, experiments can be performed with cell cultures and small animals such as mice. The exposure chamber has a volume of 50 litres allowing the exposure of up to 15 mice or 24 petri dishes (diameter: 5.5 cm). During experiments, the samples are exposed to radon-222 and its short lived daughters. The gas accumulates in a radium-226 source and is flushed into the experiment chamber. By varying the accumulation time, it is possible to adjust the radon concentration. The dose depends on the activity-concentration and the exposure time and is usually in the µGy range. During the experiments, the system operates as a closed circuit. Before removing the samples from the chamber, it is flushed with air to dilute and wash out the radon, which is collected in an activated coal filter.



Photo, GSI, Darmstadt

Relative activity of the primary Rn-222 and the daughter nuclei Pb-214 and Bi-214 over time taking radioactive decay and diffusion into account

The chamber is mounted in a heated water bath with an integrated thermostat, which enables the temperature to be controlled with high accuracy and stability. In addition, the relative humidity is controlled using a carrier gas mixed with vaporized sterile water to avoid biological contamination. For cell culture experiments, additional CO_2 regulation can be used which is deactivated for animal experiments. A summary of the different parameters and their limiting values is illustrated in the table below.

Photo: G. Otto/GSI, Darmstadt

A. Maier, G. Kraft, C. Fournier

After an intense test phase, the radon chamber was used to expose mice in therapy-like conditions, and biological tissue up to the highest possible concentration. In the mice experiments, the local exposure of radon was detected using a marker for DNA damage (double strand breaks) in various tissues. Tissue samples such as fat, bone and tendon from commercially available pork meat were used for the first measurements. These revealed that primary radon diffuses out of the tissue within a few minutes after exposure and that the residual radioactivity originates from the daughter nuclei. The amount of the primary radon in the tissue sample could be calculated from the measurement of the gamma activity of lead and bismuth using a sensitive intrinsic Ge detector. A new mobile detector system has been established that will enable in situ measurements to be performed at the radon therapy locations.

Parameter	Range
Activity concentration	0-620 kBq/m³
Temperature	20-37°C
Relative humidity	0-100%
CO_2-concentration	0-20% (only during cell experiments)

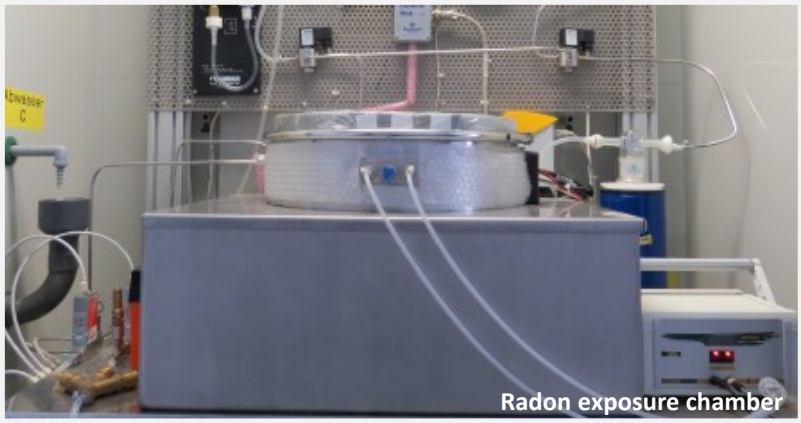


Photo: E. Thoennes/GSI, Darmstadt

Radon exposure chamber

ID Card:

Exposure type:
External (cell culture)
External/Internal (mice)

Source:
Radon-222

Dose rate:
To be determined according to the radon activity concentration, the biological half-life and the duration of the exposure

Irradiation type:
Alpha (5.5 MeV, 6.0 MeV, 7.7 MeV)

Irradiated organism type:
Cells, animals (e.g. mice)

Address:
GSI Helmholtzcenter for Heavy Ion Research, Planckstraße 1, 64291 Darmstadt, Germany

Access:
Registration for cell experiments; animal experiments need to be licensed by local authorities

Supporting lab:
Biochemistry lab, cell culture lab, microscopy, FACS

Internet link:
www.gsi.de/en/work/research/biophysics.htm

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Related to:
MELODI, EURADOS, ALLIANCE

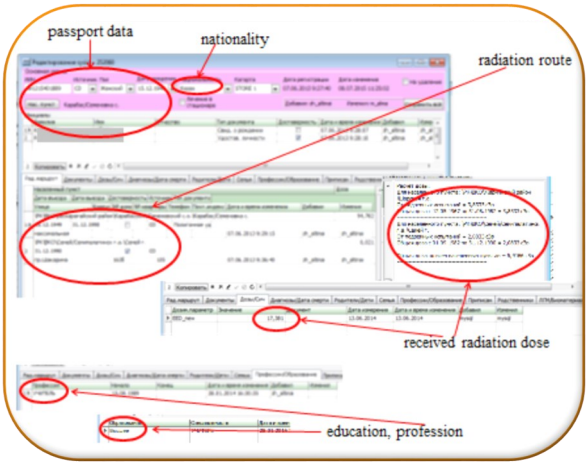
EXPERIMENTAL SETUP FOR RADON EXPOSURE AND FIRST DIFFUSION STUDIES USING GAMMA SPECTROSCOPY. A. Maier et al., Nucl. Instr. Meth. Phys. B 2015, 326: 187-193

RADON EXPOSURE SETUP FOR CELLS AND SMALL ANIMALS. A. Maier et al. GSI Scientific Report 2013, p. 247

3-Generation exposure study

Data and biomaterial for studying transgenerational effects

The Semipalatinsk nuclear test site (STS) is located approximately 150 km west of the city of Semipalatinsk (now called Semey), and was a major site for nuclear weapons-testing by the former Soviet Union. It was here that the Soviet Union conducted their first nuclear test on 29 August 1949. Later, 465 nuclear explosions were carried out between 1949 and 1989, including 118 atmospheric events (88 air events and 30 surface events) from 1949-1962. The last event was conducted at the STS on 19 October 1989. The total yield of atmospheric events conducted at STS is reported to be 6.58 megatons of TNT equivalent, which corresponds to approximately 66% of the total estimated Soviet bomb yield.



Photo, Research Institute for Radiation Medicine and Ecology Semey, Kazakhstan State Scientific Automated Medical Register

Infrastructure of the State Scientific Automated Medical Register

The 118 atmospheric events conducted between 1949 and 1962 were the primary source of radioactive contamination of the environment and of the radiation exposure to the public. The most damaging tests, in terms of exposure, were those conducted on 29 August 1949, 24 September 1951, 12 August and 24 August 1956 [1].

The Research Institute for Radiation Medicine and Ecology in Semey, Kazakhstan, runs a registry of the population living around STS. It is the successor of the 1957-founded medical institution Dispensary No. 4 of the USSR Ministry of Health whose activities included studies on the health effects of radiation exposure to those residing adjacent to the STS.

Today, the Institute does follow-ups of those affected by nuclear bomb testing and their offspring. An important tool for this task is the State Scientific Automated Medical Register, which allows long-term individual follow-up and the study of radiation-related effects using incidence and mortality data. As of November 2015, the Register held information on 316,640 subjects (209,030 alive; 107,610 deceased) [2].

Photo: salon Saur

Kazbek Apsalikov

In 2014, the Institute started collecting information on 8,400 persons from the Register, setting up the basis for a three-generation study. The following data are abstracted:

a) registration data: individual's ID, sex, nationality, date and place of birth; b) medical information (where applicable): diagnoses names and dates, congenital malformations, cause of death; c) dosimetry data: radiation route, radiation dose (based on doses assigned by Kazakh legislation, which can differ from the doses estimated by other methods); d) information on lifestyle factors: smoking, alcohol; availability of biological samples: blood, DNA, tumour and normal tissues.

This information is included in the STORE database (AIR², #3). Of the 8,400 individuals registered, 2,380 were affected by the test, 2,937 belong to the F1 generation and 3,083 to the F2 generation. Overall, the following information is available: 11,327 medical diagnosis for incident cases, 1,199 causes of death, 1,937 smoking information, 2,982 drinking information, 215 blood samples, 79 DNA, 14 cancer and 14 healthy tissue samples, and for 145 information on chromosomal aberrations.

The database for the three-generation study can be extended.

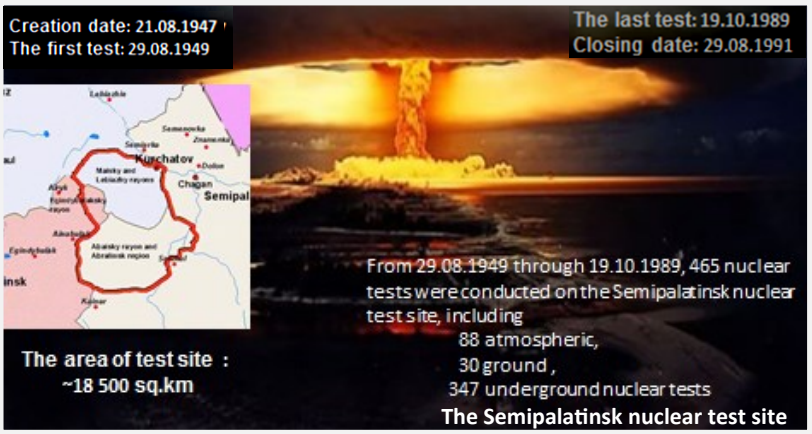


Photo: Research Institute for Radiation Medicine and Ecology Semey, Kazakhstan

ID Card:

Database topic:
Epidemiology

Information available type:
Vital status, incidence data, congenital malformation, partly biosamples, radiation dose

Data type:
Cohort

Link with a biobank:
Yes

Exportable:
Yes (MS Excel)

Species:
Human

Access:
Information through STORE, access after agreement

Contact:
Prof. Kazbek N. Apsalikov, Director of the Scientific Research Institute of Radiation Medicine and Ecology
k.n.apsalikov@mail.ru

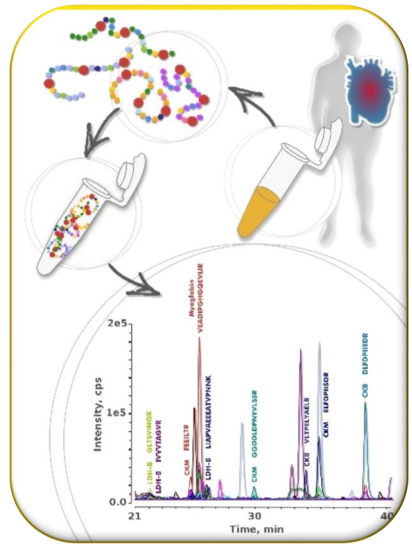
Related to:
MELODI

[1] **THE LEGACIES OF SOVIET NUCLEAR TESTING IN KAZAKHSTAN: FALLOUT, PUBLIC HEALTH AND SOCIETAL ISSUES. SOCIAL AND ETHICAL ASPECTS OF RADIATION RISK MANAGEMENT.** Bauer, et al (2013). Elsevier Science, 239-258.
[2] Statistical Report "**ANALYSIS OF THE CURRENT STATUS OF THE STATE SCIENTIFIC AUTOMATED MEDICAL REGISTER OF THE POPULATION AFFECTED BY THE SEMIPALATINSK TEST SITE.**" 2015. Research Institute of Radiation Medicine and Ecology, Semey.

ProFI

French National Infrastructure for Proteomics

Initially devoted to protein identification, proteomics today aims to provide in-depth characterization of proteomes for functional proteomics and clinical applications. This leads to new challenges, including how to quantitatively determine variations within the proteome as a result of various stimuli or different cellular states, how to detect low abundance proteins important for biology or health, how to identify protein complexes and study their dynamics, and how to analyse post-translational modifications that play a key role in protein function. Within this highly challenging context, France has created ProFI, the French national proteomics facility. ProFI was selected for funding in 2012 through the government program, "Investments for the Future", and awarded 7 years' funding (€15m). ProFI is a joint infrastructure which regroups the three best known French proteomics platforms: the Laboratory for Exploration of the Dynamics of Proteomes (CEA, INSERM and Grenoble Alps University), the Laboratory for Bioorganic Mass Spectrometry (CNRS and Strasbourg University) and the Proteomics and Mass Spectrometry of Biomolecules research group (CNRS and Toulouse Paul Sabatier University). The objectives of ProFI are two-fold: (1) to undertake R&D activities in quantitative proteomics and bioinformatics; (2) to make the services of ProFI widely available both to the scientific community and industrial sector by setting up a highly technical environment compatible with the production and processing of high quality data at very high throughput, within the context of ISO 9001 quality assurance certification.



Picture: V. Brun/CEA

Biomarkers detection and quantification using multiplex SRM Mass Spectrometry

Photo: E. Begouen/INSERM

Jérôme Garin

Using a proteomics approach to study biological or clinical problems requires access both to the protein repertory of the samples involved in the study and to the information on the abundance of these proteins and their post-translational modifications. To carry out quantitative proteomics analysis, ProFI platforms use two complementary strategies: large-scale proteomics studies without preconceptions ("shotgun" proteomics using Orbitrap mass spectrometers) and targeted quantitative studies on a few proteins of interest ("Selected Reaction Monitoring" multiplex analyses). Both the nature of the biological material and the type of questions asked will determine which of these strategies to use.

Increasing the power of computing and bioinformatics in the proteomics field is one of the main aims of the infrastructure. ProFI has developed a fully shared computing environment between Grenoble, Toulouse and Strasbourg, with the aim of facilitating data exchange and constituting a shared platform for the development of new software. ProFI has made this software environment available to the whole scientific community via its web site. Regular training sessions are offered to allow staff from academic and industrial proteomics platforms to familiarize themselves with this new environment. In this way, the resources allocated to ProFI benefit a wide community.

Proteomics lab in Grenoble

Photo: P. Latron/INSERM

ID Card:

Analytical platform type:
-Mass spectrometry
-Nano and micro liquid chromatography
-Bioinformatics

Main techniques proposed:
-Shotgun proteomics
-Targeted proteomics
-Identification of post translational modifications

Capacity:
Hundreds of samples a month

Delay to start:
Dependent on the project

Duration of experiment:
Dependent on the project. For small projects, results can be obtained in less than a month

Intercomparison exercise proposed:
Standard protein mixtures and ProFI MS data obtained on those samples are available

Training proposed:
Specific training courses are proposed (see website)

Address:
CEA Grenoble, Bat42,
17 rue des Martyrs,
38054 Grenoble Cedex, France

Access:
Projects can be submitted via the website

Internet link:
http://www.profiproteomics.fr

Contact:
Jérôme GARIN,
jerome.garin@cea.fr

Related to:
MELODI, ALLIANCE, CARPEM, NERIS

BENCHMARKING QUANTITATIVE LABEL-FREE LC–MS DATA PROCESSING WORKFLOWS USING A COMPLEX SPIKED PROTEOMIC STANDARD DATASET. Claire RAMUS et al. Journal of Proteomics (2015) 132: 51-62

MASS SPECTROMETRY-BASED WORKFLOW FOR ACCURATE QUANTIFICATION OF ESCHERICHIA COLI ENZYMES: HOW PROTEOMICS CAN PLAY A KEY ROLE IN METABOLIC ENGINEERING. Mathieu TRAUCHESSEC et al. Mol. Cell Proteomics (2014) 13, 954–9

AIR²

Access to INFRASTRUCTURES for Radiation protection Research

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models, Tools
Published to date:			
Oct 2015, #1	FIGARO	FREDERICA	RENEB
Nov 2015, #2	B3, Animal Contamination Facility	The Wismut Cohort and Biobank	The Hungarian Genomics Research Network
Dec 2015, #3	Cosmic Silence	STORE	Metabohub
Feb 2016, #4	SNAKE	French Haemangioma Cohort and Biobank	Dose Estimate, CABAS, NETA
Mar 2016, #5	Radon exposure chamber	3-Generations exposure study	ProFI
Coming soon:			
Apr 2016, #6	BIO Facility	Wildlife Transfer Database	Radiobiology and immunology platform (CTU-FBME)

Future events:

ERRATUM: Conferences organised by WASET (ICMPRPR 2016 and ICRRP 2016) are fake!

April 2016: Deadline for the 1st Transnational Call for Proposals of EJP CONCERT

10-15 April 2016: 1st International Conference on Radioanalytical and Nuclear Chemistry, RANC-2016, Budapest, Hungary
Registration: open

9-13 May 2016: 14th Congress of the International Radiation Protection Association, IRPA14, Cape Town, South Africa
Registration open until 1st May 2016

17-18 May 2016 : Health Effects of Chernobyl: Prediction and Actual Data 30 Years after the Accident, Obninsk, Russia

1-3 June 2016: 2nd International Conference on Risk Perception, Communication and Ethics of Exposures to Ionising Radiation, RICOMET 2016, Bucharest, Romania

15-17 June 2016: COMET Workshop "Models fit for purpose", focussed on modelling in radioecology. Seville, Spain

4-8 Sept 2016: 42nd Annual Meeting of the European Radiation Research Society, ERR2016, Amsterdam, Netherlands
Registration open

19-23 Sept 2016: Radiation Protection Week, RPW2016, Oxford, UK.

3-5 Oct 2016: International Conference on Research nfrastructures, ICRI2016, Cape Town, South Africa

5-7 Dec 2016: 8th EAN_{NORM}, Stockholm, Sweden.
Call for papers open

Editorial Committee: Jean-Michel Dolo, Elisabeth May, Laure Piqueret-Stephan, Laure Sabatier

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