AIR2
Access to INFRASTRUCTURES for Radiation protection Research

Issue 3
December 2015

Editorial

The MELODI meeting in Munich hosted scientific discussions of the WP6 members and the Management Board, which allowed us to re-focus the scope of our WP in a very effective way. Going beyond infrastructures, we enlarged the Quality Management and Open Access processes to include all data obtained within CONCERT. Also, in order to keep the field as open as possible to new infrastructures, we decided to abandon the selection of "recommended infrastructures" and adopt instead "recommended criteria" that infrastructures must fulfil.

This is the last issue of AIR2 for 2015. The next one will be in February 2016.

Although we are mourning the tragic events in Paris, we shall keep our hearts open with hope for the future. And in this spirit, I would like to wish you all the best for 2016. **Dr Laure Sabatier - CEA**

The floor to...

Looking back to ten years ago, there was great concern about the future of low dose risk research in Europe and worldwide, due to declining resources. This decline was evident both for human resources as well as for infrastructures. The decline also hampered the long-term sustainability of research data and archives. At the same time, however, new issues and paradigms were arising, which called for new competencies and multidisciplinary approaches. Such scientific challenges included, for example, non-DNA-targeted effects, non-cancer effects and individual factors affecting radiation risk.

"It was evident that the groups needed to work together, to find ways to accommodate new disciplines and approaches, and to better manage knowledge and infrastructures"

To resolve the scientific uncertainties underlying the system of radiation protection, and to cope with issues on sustainability, it was evident that the groups needed to work together, to find ways to accommodate new disciplines and approaches, and to better manage knowledge and infrastructures. No single group, institute or even country could solve the scientific issues alone.

Since the publication of the HLEG Report in 2009, there has been rapid integration of research related to radiation protection. Platforms such as MELODI, ALLIANCE and NERIS have been established and these platforms now have the necessary structures and working groups for the continuous updating of Strategic Research Agendas, for managing infrastructures and for coordinating education and training. The DoReMi Network of Excellence has played a key role in setting up the operational structures for the integration of research in low dose risk. It is very gratifying to see what can be achieved in just a few years, by working together towards a joint goal.

Looking at where we are now, the MELODI 2015 workshop in Munich revealed that considerable scientific progress has been made in several areas, such as low dose risk, radioecology, emergency preparedness, dosimetry and medical radiation.

Much of this progress has been achieved through access to high-quality irradiation facilities, databases, sample banks and analysis platforms, models and tools.

Dr Sisko Salomaa - STUK
CONCERT WP2 Leader
« Integration and SRA development in radiation protection research »
DoReMi Coordinator

Photo: S. Inkinen/STUK

CONCERT CORNER

Future events:

11 Jan 2016: Launch of 1st Call

15 Feb 2016: ExB Meeting, Pavia, Italy

16 Feb 2016: MB Meeting, Pavia, Italy

WP 6 News:

Launch of Working Goup:

1. Exposure platforms, Contaminated Sites, Observatories: Lead : Andrzej Wojcik (SU)

2. Databases, Sample Banks, Cohorts: Lead: Fieke Dekkers (RIVM)

3. Analytical platforms, Models, Tools: lead: Ulrike Kulka (BfS)

31 Jan 2016: D6.2 due
List of infrastructures with recommended criteria for radiation protection research

16 Feb 2015: WP6 Work session:
15:30-18:30, Pavia, Italy

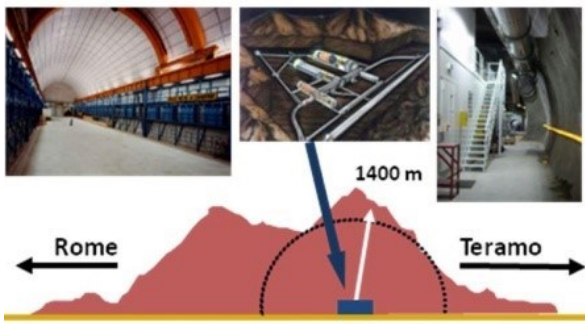
Contents:

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

PULEX-COSMIC SILENCE

Extremely low radiation background facilities at INFN-LNGS

The Gran Sasso National Laboratory (LNGS) in Italy is one of the four national laboratories of the INFN (National Institute for Nuclear Physics). It is the largest underground laboratory in the world devoted to neutrino and astroparticle physics. Located between L'Aquila and Teramo, approx 120 km from Rome, the underground structures are situated on one side of the 10 km long highway tunnel which crosses the Gran Sasso massif. The underground complex consists of three huge experimental halls and bypass tunnels. The halls are equipped with all technical and safety equipment and plants necessary for the experimental activities and to ensure proper working conditions for the people involved.



Picture: modified from Eur. Phys. J. Plus (2012) 127: 37

The INFN-LNGS underground laboratory

The PULEX cell culture facility is located in one of the bypass tunnels. The facility was set up to perform in vitro experiments in extremely low radiation background in the context of a close collaboration between INFN, Istituto Superiore di Sanità (ISS) and Centro Fermi. In this environment, the natural coverage of 1400 m thick rock provides a reduction factor of one million in the cosmic ray flux, and the neutron flux is a thousand times less than on the surface. In the PULEX facility, the Radon concentration is kept at a very low level by an efficient ventilation system that pumps air from the outside. Moreover, the cell culture laboratory hosts two CO2 incubators, one of which is shielded with 5 cm of Fe to further reduce the gamma component of the radiation spectrum.

Since the pioneering work on yeasts carried out by Satta and co-workers in the late 90's, several experiments have been performed using rodent and human cell cultures grown in parallel in the PULEX facility and in external laboratories, with the aim of investigating if modulation of the radiation environment can modify the biochemistry of biological systems and their response to genotoxic agents. Interestingly, the overall results obtained using different in vitro models have shown that cells cultured in a strongly reduced radiation environment are less tolerant to radiation-induced DNA damage and less efficient in scavenging reactive oxygen species than cells grown in the external reference environments.

Photo: M. Sabatini/ISS

Antonella Tabocchini

At present, an animal house facility is under construction next to the PULEX cell culture laboratory. This new facility, named COSMIC SILENCE, will be provided with temperature and light control systems, as well as an independent ventilation system. Once it is ready, the first planned experiments will be done with Drosophila melanogaster. In the future, after authorization, it will be possible to perform experiments with mice. To this end, the facility has been designed to host a 60-cage mouse rack.

On a smaller scale, the PULEX-COSMIC SILENCE facilities nicely complement the FIGARO facility allowing radiobiological investigation in a radiation environment below the average background level. The PULEX facilities are open to collaboration, including use of other organisms, and any suggestions for projects with CONCERT partners are very welcome.

Inside and outside the PULEX cell culture facility underground the LNGS

Photo: M.A. Tabocchini/ISS

LOW ENVIRONMENTAL RADIATION BACKGROUND IMPAIRS BIOLOGICAL DEFENCE OF THE YEAST SACCHAROMYCES CEREVISIAE TO CHEMICAL RADIOMIMETIC AGENTS. Satta et al., 1995. Mutat Res 347:129-133

LOW-RADIATION ENVIRONMENT AFFECTS THE DEVELOPMENT OF PROTECTION MECHANISMS IN V79 CELLS. Fratini et al., 2015. Radiat Environ Biophys 54:183–19

ID Card:

Exposure type:
External (extremely low radiation background)

Source:
Environmental radiation with negligible contribution by directly ionizing cosmic rays and neutrons

Dose rate:
~ 4 nGy/h (with Fe shielding)
~ 40 nGy/h (w/o shielding)

Irradiation type:
gamma (cosmic & terrestrial), alpha (radon)

Irradiated organism type:
Presently cells and small animals, e.g. insects, worms. Mice in the future, after authorization.

Address:
Laboratori Nazionali del Gran Sasso
Via G. Acitelli, 22
67100 Assergi L'Aquila, Italy

Access:
Joint research collaboration and scientific committee approval

Supporting lab:
external cell culture lab, (bio) chemistry lab

Internet link:
https://www.lngs.infn.it/en

Contact:
Maria Antonella Tabocchini : antonella.tabocchini@iss.it, +39 0649903020
Marco Balata: marco.balata@lngs.infn.it +39 0862437292

Related to:
MELODI, ALLIANCE

STORE

An infrastructure for sharing of data and resources

Sharing primary data to enable accountability, reproducibility and re-use has become a concern for the whole of the scientific community in recent years. Funding agencies and journals alike now insist that the products of publicly-funded science are made freely available. The European Commission has been in the forefront of open data policies, and the sharing of data and biomaterial from publicly-funded radiation protection related science will be required by Horizon 2020. Open data adds great value to the original investment and yields substantial scientific rewards [1].

Picture: P. Schofield/UCam

Example of STORE screenshots

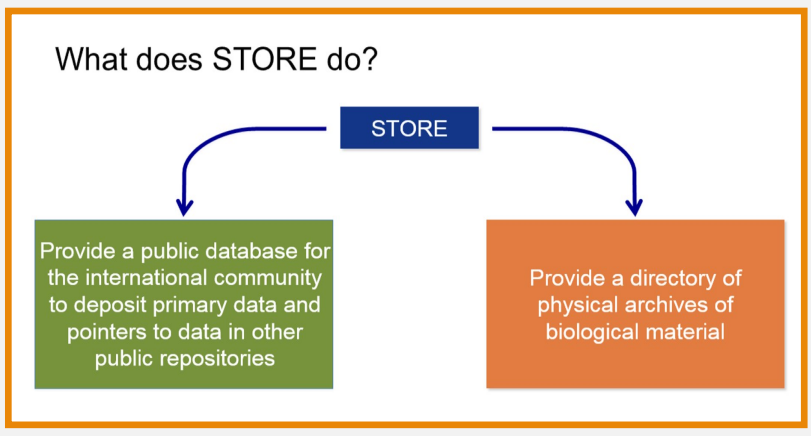
Based on experience from the ERA database [2], the STORE consortium created a platform to provide an infrastructure for the storage and dissemination of data from radiobiological research. When STORE became part of DoReMi, it was broadened to fit the needs of radiation epidemiology and it took on the additional role of acting as a directory of bioresources. With the start of CONCERT, it became clear that the needs of other platforms or consortia should also be considered, e.g. ALLIANCE and RENEB. CONCERT's Subtask 6.2.1 will develop STORE according to this new user need, and a contract between BfS and the University of Cambridge, the developer of STORE (UCam, Paul Schofield), has been signed within the framework of CONCERT.

STORE is a platform for resource sharing which enables users to locate data or bioresources, such as physical samples (tissue samples, FFPE blocks, slides, etc.), using structured metadata and standard vocabularies. Users, identified by their ORCID IDs, can upload primary data of any format, accession IDs for data in other databases, and details of physical samples. Data is assigned an accession number and will be given a DOI which will enable it to be cited in publications. Uploading is project-based and users retain control and ownership of their data. The BfS provides long term sustainability and data security so that users can be assured of longevity and security. Data may be stably archived for future use, cited in support of publications, or shared between collaborators. The database has additional applications for standardisation, validation, education and radiological emergency resilience.

Photo: R. Kanzliwius/BfS

Bernd Grosche

STORE is available at http://www.storedb.org. The resource is open and free to individual investigators, journals and funding agencies. It establishes the basis for long-term use and exchanges between scientists from different countries and from various fields; in addition, its flexibility and agility allows it to act as a sharing and archival infrastructure for the whole radioprotection research community. Links to other relevant databases have already been established (e.g. CTB, ERA, Janus) and further links will follow (e.g. FREDERICA). STORE will be federated with the European Commission's re3data initiative, Biosharing, and will be compliant with Nature Scientific Data's criteria for recognised repositories. Questions and suggestions are welcome at store@bfs.de.



Picture: P. Schofield/UCam, & B. Grosche/BfS

ID Card:

Database topic:
Primary data from low dose radiation studies, materials and bioresources.

Description:
STORE is a platform for the archiving and sharing of the primary data outputs from research on low dose radiation. In addition it provides a directory of bioresources and external databases containing relevant information and materials that investigators are willing to share.

Data ownership:
Ownership of Data remains with the originator, but the database is under the direction of BfS and UCam.

Data type:
Any kind of data, no format requirements

Access:
Free to deposit and recover data. Sign up via ORCID ID. Data can be selectively released by the originator or made totally open.

Exportable:
Data can be exported

Species:
Humans, animals, plants (to come)

Internet link:
http://rbstore.eu; http://storedb.org

Contact:
store@bfs.de
At BfS:
Bernd Grosche, bgrosche@bfs.de
Ulrike Kulka ,ukulka@bfs.de
Mandy Birschwilks, mbirschwilks@bfs.de
At UCam:
Paul Schofield ,pns12@cam.ac.uk
Michael Gruenberger (technical support), mg287@cam.ac.uk

Related to:
CONCERT, MELODI, ALLIANCE, RENEB

[1] **ARCHIVING LESSONS FROM RADIOBIOLOGY.** Schofield PN, Tapio S, Grosche B. Nature 2010; 468:634-634
[2] **THE EUROPEAN RADIOBIOLOGICAL ARCHIVES: ONLINE ACCESS TO DATA FROM RADIOBIOLOGICAL EXPERIMENTS.** Birschwilks M, et al. Radiat Res 2011; 175:526-531.

MetaboHUB

French National Infrastructure for Metabolomics and Fluxomics

MetaboHUB is the French national facility in metabolomics and fluxomics selected in 2012 in the framework of the programme "Investissement d'Avenir" for a 7 years funding. It proposes advanced research services in metabolomics and fluxomics to provide opportunities for integration into other European infrastructures. The MetaboHUB infrastructure offers tools and services to academic research teams and industrial partners in the fields of nutrition and health, agriculture and biotechnology.

Photo: L. Lizet/INRA

Metabolomics relies on NMR and MS based technologies coupled with data mining tools

The objectives of the MetaboHUB infrastructure are fourfold: (i) to identify metabolites in human biofluids, as well as in plants, microorganisms and animal cell extracts, through the implementation, curation and maintainance of centralised, open spectral repositories for metabolite annotations, (ii) to provide high-throughput, quantitative technologies for biochemical phenotyping of large sets of samples and for systems biology, (iii) to develop large-scale flux profiling and subcellular fluxomics, and (iv) to attract a new generation of scientists and users by promoting metabolomics through education and training.

The MetaboHUB infrastructure will be developed in two interlinked phases: a construction phase and an operational phase. The construction phase (the first four years) is dedicated to harmonising, implementing and upgrading the four existing platforms with common metabolomics and fluxomics tools and methods, in order to build a world-class research centre and database in the field of metabolomics. To this end, the work plan is organised into 6 work packages (WP): Multi-site implementation of analytical chemistry for metabolite detection, quantification and identification (WP1); Fluxomics (WP2); Shared bioinformatics tools for data management and mining (WP3); Quality management (WP4); Coordination of services, governance and access to infrastructure (WP5), and Communication, training and technology transfer (WP6). The operational phase will be dedicated to handling the rise in the day-to-day activity of this national infrastructure which will operate as a world-class research centre in metabolomics, open to both academic and private partners. Activities and services will include providing spectral databases, centralised data repositories, standardised analytical methods for metabolomics, reagents for absolute quantification of metabolites, data mining tools and platforms capable of analysing large numbers of samples from large-scale projects.

Photo: S. Leblois/CEA

Christophe Junot

The French MetaboHUB project includes the four main French metabolomics platforms accredited with the national IBiSA quality standard. These are: the Bordeaux Metabolomics Platform (BMP, INRA and University of Bordeaux), the MetaboHUB-Paris Platform (Paris area - CEA and Pierre et Marie Curie University), the MetaToul Platform (Toulouse, Paul Sabatier University, INSA, INRA, CNRS and INSERM) and the Metabolism Exploration Platform (PFEM at Clermont-Ferrand, INRA and Blaise Pascal University). These four partners develop shared tools and expertise for basic and applied research projects.

Photo: INRA

ID Card:

Analytical platform type:
Nuclear Magnetic Resonance (NMR), Mass Spectrometry (MS), Statistical analyses and data mining, bioinformatics

Main techniques proposed:
- Targeted metabolite analyses
- Metabolite identification
- Non targeted metabolomics
- Non targeted lipidomics
- ^{13}C fluxomics
- Metabolic network analysis

Capacity:
Dependent on the application. MetaboHUB is able to handle cohorts of a few hundreds of samples for untargeted and targeted metabolomic studies.

Delay to start:
Dependent on the project.

Duration of experiment:
Dependent on the project.

Intercomparison exercise proposed:
Not available for the moment. Analyses of reference material such as NIST plasma are envisaged.

Training proposed:
Specific trainings on MS, NMR and data mining tools can be proposed by MetaboHUB platforms.

Address:
MetaboHUB, INRA center of Bordeaux
71 avenue Edouard Bourleaux
33140 Villenave d'Ornon, France

Access:
Projects can be submitted to the executive management board at any time.

Internet link:
www.metabohub.fr/

Contact:
contact@metabohub.fr

Related to:
MELODI, ALLIANCE, CARPEM, RENEB

ANALYSIS OF THE HUMAN ADULT URINARY METABOLOME VARIATIONS WITH AGE, BODY MASS INDEX, AND GENDER BY IMPLEMENTING A COMPREHENSIVE WORKFLOW FOR UNIVARIATE AND OPLS STATISTICAL ANALYSES. Thévenot EA et al., J Proteome Res. 2015;14(8):3322-35.

COORDINATION OF STANDARDS IN METABOLOMICS (COSMOS): FACILITATING INTEGRATED METABOLOMICS DATA ACCESS. Salek RM et al., Metabolomics. 2015;11 (6):1587-1597.

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
Coming soon:			
Feb 2016, #4	SNAKE	French Hemangioma Cohort	Dose estimate, Cabas, NETA

Future events:

10 Dec 2015: deadline for the 1st E&T CONCERT call

5-7 Dec 2015: call for papers for the 8th EAN_{NORM}, Stockholm, Sweden.

17-18 March 2016: 18th International Conference on Medical Physics, Radiation Protection and Radiobiology, ICMPRPR 2016, London, UK
Registration open until 17 Nov 2015 (paper submission)

24-25 March 2016: 18th International Conference on Radioactivity and Radiation Protection, ICRRP 2016, Madrid, Spain
Registration open until 24 Nov 2015 (paper submission)

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

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 Infrastructures, ICRI2016, Cape Town, South Africa

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

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