Research infrastructures are committed to provide access to the most advanced, unique, and large-scale resources, instruments and expertise in Europe. These services enable European scientists to conduct competitive and cutting edge research. The necessity to focus on research infrastructures in Radiation protection has been highlighted in the HLEG report in 2009. Since then, large EURATOM projects such as DoReMi, OPEPPRA, STAR... include specific WPs and tasks dedicated to infrastructures.

Surveys performed in former projects have revealed that the prevailing opinion is that most necessary infrastructures are already available although not at the bench of each user. Indeed, besides the funding of experiments, the access to state of the art infrastructures is a major bottleneck. It will be the major focus of CONCERT WP6: Access to Infrastructures.

Infrastructures include so-called large infrastructures such as exposure facilities including those for animal and plant experiments (both laboratory and field facilities), epidemiological cohorts, biobanks, databases and analytical platforms (including e-infrastructures). The WP6 tasks and subtasks are described in the scheme. The first focus will be the listing of infrastructures and the description of requested criteria. Extensive lists of relevant large infrastructures were generated for low dose research, radioecology, and dosimetry, but they need to be updated, to include those of all European partners and to be completed for the other radiation protection platforms, NERIS, and Medical Use. The resulting database will have to be searchable. Then, to best utilize existing resources, the emphasis will be on promoting the visibility and use of mature infrastructures, so as to avoid unnecessary costs and duplication. Moreover, the sustainability of rare but necessary facilities (such as those for internal contamination) will be given priority. Furthermore, an effort will be made to harmonize practices and protocols amongst multiple facilities. The use of certain types of infrastructures or the analysis of resulting data requires a high level of expertise and training. Working closely with WP7 - Education and training, WP6 will examine the possibility to develop specific training courses built around the use of infrastructures. Last but not least, funding strategies will be developed.

The CONCERT Infrastructure Bulletin will be published each month (10/year) in order to develop the means to better inform radiation protection scientists of those facilities that are best adapted to their research needs and to increase the visibility of recommended infrastructures. Three infrastructures will be described; one amongst exposure platforms, one amongst databases, biobanks, and cohorts and one amongst analytical platforms. These will then be published as a web-Handbook.

I invite you to provide your feedback concerning the Bulletin and to indicate how we can improve it. Your comments will be most welcome.

Dr Laure Sabatier - CEA
CONCERT WP6 Leader
« Access to Infrastructures »
FIGARO

Low Dose Irradiation Facility at the Centre for Environmental Radioactivity

The Norwegian University of Life Sciences (NMBU) has had a gamma irradiation facility on campus since 1952. In 2003 a facility for low-dose exposure ecotoxicological experiments was opened and used for a variety of chronic and sub-chronic exposure studies (e.g., fish, mussels, earthworms, plants). With the support of DoReMi, the facility underwent extensive upgrades in 2012 in order to meet the requirements for small rodent chronic exposure experiments. The present facility, FIGARO, at the Centre of Environmental Radioactivity (CERAD), is equipped with a climate control system (temperature, light, humidity), and is fully approved as an animal research facility, including the use of GMO rodent and other plant and animal models.

FIGARO is primarily designed as an external gamma irradiation facility, although it is also authorised for radionuclide internal exposure (including alpha emitters), as well as other chemical stressors (e.g., metals, organics, nanoparticles) and UV exposure. The irradiation source is 12 Ci Co-60 which provides a continuous dose rate field from 3 Gy/hr (at source) down to 400 μGy/hr and allows simultaneous, chronic exposure of samples over the whole dose-rate field. A temperature and pH controlled flow-through system is available for aquatic organism exposures. The climate control specifications for the experimental hall are:

- Temperature: 4 - 37 °C (+/- 1 °C)
- Light: ca. 50 - 300 lux with automatic dimmer (10 min)
- Humidity: 45 - 65% (ScanClime)
- Ventilation: 300 m3/h

The capacity for small rodent irradiation depends on the dose rate and the animal cage system. FIGARO has access to both ScanClime (www.scanbur-technology.com) and Innovive racks. As an example, irradiation of up to 150 mice can be carried out at 2 mGy/hr with an additional 80-160 controls, and larger numbers can be accommodated at lower dose rates. DoReMi has supported two collaborative projects involving long-term irradiation of mice (up to 3 months). The OSTINATO project investigated the impact of chronic irradiation on the onset of Parkinson disease in a predisposed mice model and CLOGIGAT studied gut cancer incidence in APCmin/+ mice. These projects involved the successful transport, irradiation and return of more than 1000 mice to respectively Germany and the UK.

CERAD continues to carry out a number of studies using other organisms, focusing on both mechanistic and ecotoxicological investigations. In addition to mice, 2014-2105 saw experiments on zebrafish, nematodes (c elegans), salmon, algae, daphnia, earthworms and various plant species.

CERAD/FIGARO is open for collaboration, and we welcome suggestions for projects with CONCERT partners.
Knowledge of ionising radiation-induced effects on diverse organisms is crucial to assess the radiological impact on the environment. The FREDERICA radiation effects database was developed to provide an online compilation of the known effects of ionising radiation on non-human species. The database was produced under the EC funded project ERICA (Environmental Risk from Ionising Contaminants: Assessment and Management) and is available online (see link in ID Card).

FREDERICA contains some 30,000 data entries from 1,231 references. The data entries correspond to pairs of points (exposure level, biological effect) along with information on the conditions in which these data were obtained (tested species, life stage, exposure regime, effect endpoint, etc.). The data are organised into wildlife groups (amphibians, aquatic invertebrates, aquatic plants, bacteria, birds, crustaceans, fish, fungi, insects, mammals, molluscs, mosses/lichens, reptiles, soil fauna, terrestrial plants and zooplankton). While the biological effects reported in the database are at an individual level, the endpoints considered include those relevant to possible responses at the population level (e.g. reproductive capacity, mortality, morbidity and mutations) [1].

Each reference in FREDERICA was reviewed for the information that is available to the reader in relation to dosimetry, experimental design and statistics. The information provided was scored to reflect the presence or absence of these key data. This provides a measure of the quality of the information in each reference so that if further work is needed (e.g. to refine risk assessment criteria) those papers which contain most, if not all, of the likely information can be easily found.

Within the information compiled in FREDERICA, 64% of the data sets have been obtained after acute and transitory exposure to radiation (59 and 5%, respectively), whereas 36% of the data sets have been obtained after chronic irradiation. Chronic irradiation studies are considered to be more relevant to environmental radiological protection [2]. Considering chronic exposure data, fish, mammals and terrestrial plants are the wildlife groups most widely reported, representing 70.5% of the FREDERICA data for chronic irradiation. The information is scarce for bacteria, crustaceans, fungi, moss and lichen, and zooplankton, since only one or two references have been found for these groups. There is no information on the effects of chronic irradiation for amphibians, aquatic plants or reptiles [1].

FREDERICA offers several search capabilities (see Figure above), for which outputs can be exported as an Excel or text file.

The FREDERICA database has been used in many applications, such as:
- Helping define biological effect levels.
- Inclusion as part of the ICRP Reference Animals and Plants (RAPs) review.
- Inclusion as part of the UNSCEAR review on biological Endpoints.
- Integration into the ERICA Tool to perform environmental risk assessments.

Databases, Biobanks, Cohorts

FREDERICA

A unique database on the effects of ionising radiation in non-human biota

ID Card:

- Database topic: Ionising radiation-induced effects
- Information available type: Exposure-biological effect, species, life stage, irradiation regime. Searchable
- Data type: Peer reviewed articles
- Link with a biobank: No
- Exportable: Yes
- Species: Non-human animals and plants
- Internet link: http://www.frederica-online.org/mainpage.asp
- Access: Free (user needs to register)
- Contact: Almudena Real: almudena.real@ciemat.es; +34 913 466 750
  David Copplestone: david.copplestone@stir.ac.uk; +44 01786 467852
- Related to: ALLIANCE

Search capabilities of the FREDERICA database

[FREDERICA Radiation Effects Database]

[Information contained in FREDERICA]

[Numbers correspond to %% of the references within FREDERICA]

[Type of radiation exposure: Acute, Chronic, Transitory]

[Type of study after chronic irradiation: Field, Controlled Field, Laboratory]
RENEB
A network for emergency preparedness and scientific research

RENEB is a European Biodosimetry Network, able to perform large scale rapid biodosimetric dose estimation. Specialized to handle a large number of samples, RENEB contributes to radiological emergency preparedness and large scale research projects. The network infrastructure is based on reliable assays and techniques combined with high performance standards. To enhance the effectiveness of the network, RENEB is linked to global emergency preparedness and response systems as well as to the European radiation research area.

As such, RENEB as an analysis platform is of special interest for the Emergency Preparedness Platform NERIS by adding preparedness in the field of individual dose estimation. Moreover it benefits MELODI and EURADOS by providing capacity for radiation research and specialized biomarker development. Concerning the latter, the radiological Platform ALLIANCE will also profit from RENEB. Last but not least, RENEB provides intercomparisons, specialized courses and seminars open also to laboratories outside the network, thus being of relevance for E&T in the CONCERT-EJP.

RENEB was never meant to be a “time limited or closed club” and strategies were developed to identify “candidates” and integrate them as solid partners. Currently, RENEB comprises 22 partners and 7 candidates from 17 European countries. 16 have already signed a MoU, and thus form the nucleus of a unique growing infrastructure, combining high quality standards in the application and validation of biomarkers and maintenance and advancement of scientific and technical competence.

The network was initiated in January 2012 with 23 partners from 16 European countries with the support of the EC (EURATOM FP7, GA 295513). At this time the focus was on emergency preparedness with the aim to significantly increase dose reconstruction capacities in case of large-scale radiological scenarios. Individual dose estimation based on biological samples and/or inert personalized devices has been optimized to support the rapid categorization of many victims according to the received dose. Communication and cross-border collaboration was standardized and cooperation with national and international emergency and preparedness organizations such as IAEA and WHO were initiated.

The value of RENEB to support topics also outside emergency preparedness is now evident. With established strategies to guarantee consistent performance between the partner laboratories, the network has the ability and capacity to contribute to large scale research projects with the analysis of exposure biomarkers. This includes studies on the effects of low doses, group related radiation sensitivity, contribution to non-cancer diseases, and epidemiological studies where sampling and handling of bioprobes is included. RENEB also drives the development and evaluation of new exposure markers with special view to their applicability for addressing acute or protracted exposures as well as exposures dating back years or decades.
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**Future events:**

Registration: over

9-11 Nov 2015: 7th MELODI Workshop, Munich, Germany
Registration: until 31 Oct 2015

Registration: until 17 Nov 2015 (for author)

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

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

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

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

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**Access to Infrastructures for Radiation protection Research**