

Editorial

This month, the projects selected under the 1st CONCERT Call will be revealed, but we're already working on the 2nd Call. As these projects will have an end date of 31 December 2019, it's vital to start them ASAP to allow enough time to complete the deliverables.

Infrastructure access is also crucial, and the more visible the infrastructures are in AIR² and AIR²D², the easier it will be to select the one best suited to each project. Some types of infrastructure are still missing from the database, e.g. Neris and EUROMED (i.e. there are almost no infrastructures for image-guided small animal radiotherapy listed although several are available in EU countries).

Finally, don't be secretive and shy - inundate us with your requests to contribute to AIR², and fill out the AIR²D² forms for all your infrastructures!

Dr Laure Sabatier, CEA

The floor to...

Despite the provisions in place for managing emergency and recovery situations, there is still a need for improvement at technical, organisational, societal and political level. NERIS (European Platform on Preparedness for Nuclear and Radiological Emergency Response and Recovery) was set up to contribute to improving the effectiveness and coherency of current approaches to preparedness, to identify further development needs, and to improve know-how and technical expertise.

The Fukushima accident highlights the need to develop improved data assimilation techniques for dispersion modelling to increase awareness in the early phase. Models able to account for site-specific characteristics are also expected. The Fukushima accident shows the usefulness of having a European analytical platform where data and information from governmental and non-governmental organisations can be collected, validated and made available to all interested parties. Such a platform was developed within the PREPARE project, funded by the European Commission.

The Fukushima accident draws attention to the importance of increased transparency in decision-making processes at all levels. Various issues have been identified including the need to provide accurate information to promote efficient use of decision-support systems and allow better allocation of resources in response to stakeholder expectations.

Communication and information issues are also of great importance due to requirements for huge amounts of information and measurements and the use of modern social media. The Fukushima accident has led to reviews of the existing framework for public participation, notably in relation to the Aarhus Convention, with the goal of ensuring appropriate stakeholder engagement, information exchange and dialogue.

For NERIS, the role of infrastructure is essential. It involves the structuring of knowledge databases and analytical tools that rely on experience feedback, but also the development and use of infrastructures (some developed by other platforms) such as networks for early warning and capacity monitoring, as well as for protective actions such as decontamination facilities or biological dosimetry laboratories.

Dr Thierry Schneider
CEPN
NERIS President



Photo: CEPN

Future events:

18 Nov 2016: CONCERT open consultation meeting for 2nd Call, Brussels, Belgium

Jan 2017: Launch of 2nd Call

WP 6 News:

AIR²D²:

- Please complete the online [form\(s\)](#) to register your infrastructure(s) in the database.

- A new option to feature your infrastructure is now available: [add document](#).

ERRATUM: Issue11

Exposure platforms- LIBIS, line 19 « down to 2mGy/h » should read « down to 2μGy/h »

Contents:

Exposure platforms	Microtron laboratory
Databases, Sample banks, Cohorts	EPI-CT scan cohort
Analytical platforms, Models, Tools	CATI

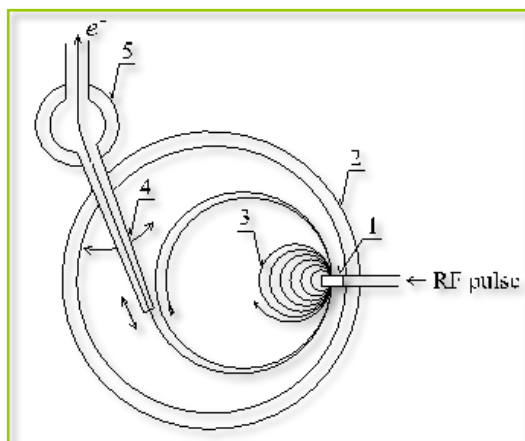
Next issue

December 2016

Microtron Laboratory

Microtron for biomedical, environmental and PAA procedures

The MT 25 Microtron in Prague is a cyclic electron accelerator with a Kapitza type resonator. The particles are accelerated by an RF electric field of constant frequency in a constant uniform magnetic field. In the vacuum chamber, the electrons follow circular paths with a common tangent point. The accelerating cavity, which is excited by the RF field, is located at this point. The Microtron MT 25 serves as a source of relativistic electrons (primary electron beam), secondary photon beams (bremsstrahlung) and neutrons from nuclear reactions.



The microtron scheme

Examples of accelerator applications:

Radiation resistance testing and studies in well controlled and monitored conditions are possible for electron and photon beams and for neutrons. Photon beams are frequently used for photon activation analysis of geological, biological, environmental and other samples. This method allows non-destructive determination of a large number of elements. The laboratory is equipped with a coaxial HPGe detector and multichannel analyser. The microtron laboratory was recently installed with a fully automatic pneumatic post for fast transport of samples between irradiation positions and a HPGe detector. This system expands the possibilities of photon activation analysis, as it enables determination of samples with short half-life. Some photo-nuclear reactions can produce a number of radionuclides. For example, it is possible to install a pilot apparatus for ^{123}I production. ^{124}Xe is irradiated under pressure; this radioisotope is generated for radiopharmaceutical production in an external workplace. The single workstation is

equipped with a contrivance for the generation of highly homogeneous gamma and electron fields which determine with exactitude the values of dose rate (gamma fields – max. 10 Gy/min, electron fields – several hundred Gy/min, field size is $10 \times 10 \text{ cm}^2$). The calibrated ionisation chambers for gamma and electrons are made available (with relevant measure lines and a precision calibrated electrometer). The microtron laboratory is equipped with accurate, integral, electron current measurement from 10^9 to 10^{16} electrons/ cm^2 for nuclear physics purposes.

Radiation colouring of plastic materials, glasses and crystals produced by bremsstrahlung, and the modifications of their optical, electrical and mechanical attributes can be studied and tested. Both electron and photon beams are suitable for sterilisation. In the case of the electron beam, the sterilisation dose is reached within a few minutes (depending on the sample size). The beams with energy of up to 10 MeV are used for irradiation of biological, food and similar sample types. Crosslinking improves some properties of the polymers. Irradiation creates free radicals which will often produce various chemical reactions. The free radicals can recombine forming crosslinks. Radiation crosslinking can be performed using electron or photon beams. Electron beams are also used to produce the NV centres in nanodiamonds.



Photo: Chvatil/NPI

David Chvatil



Vacuum chamber of the accelerator

Photo: Chvatil/NPI



ID Card:

Exposure type:

External

Source:

Electron accelerator Microtron MT25

Dose rate:

0.01 Gy – 10 kGy / min

Irradiation type:

Electron and gamma beam, neutron

Irradiated organism type:

Cells, animals (fish, rodents etc.) vegetal...

Address:

Nuclear Physics Institute of the CAS, p.r.i., Řež 130, 25068 Řež, Czech Republic

Access:

Free

Supporting lab:

SPF animal facility for experiments and breeding of small rodents, cell culture and immunology laboratory, microscopy

Internet link:

<http://accs.ujf.cas.cz/mt25>

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Related to:

MELODI, ALLIANCE

EPI-CT scan cohort

A multinational cohort of children who have undergone a computed tomography

EPI-CT is designed as a multinational cohort study of children and young adults who have undergone at least one computed tomography (CT) scan before the age of 22 years. It comprises three main parts: 1) an epidemiological cohort study assessing cancer effects of radiation exposure from CT; 2) a dosimetry system to evaluate individual doses and related uncertainty, and supporting dose reduction and optimisation strategies; 3) a pilot study to evaluate the feasibility of applying different biomarkers of hypersensitivity in young patients exposed to low doses from CT.

including uncertainty analysis, is based on a two-dimensional MC (2DMC) simulation approach, which provides alternative realisations of sets of doses for each organ of interest resulting from more than 2,000,000 CT examinations. The impact of various sources of bias on



Photo: IARC

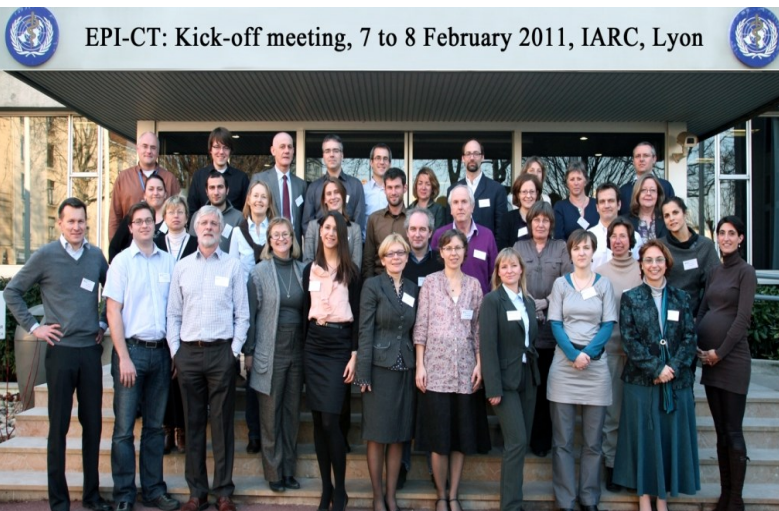
Dr Ausrele Kesminiene

estimates of cancer risk is being characterised in countries where this information is available. Simulation studies are being conducted to investigate the impact of bias on the risk estimates from the entire study.

The biological pilot study has demonstrated that chromosomal aberration and DNA double-strand break induction rates were higher following CT irradiation of blood samples from newborns and young children compared to adults; these differences were also

visible in the γ -H2AX-foci assay. *In vitro* assessment of the γ -H2AX-foci assay demonstrated that it is technically feasible to apply this assay in a multicentre prospective CT study.

As the largest and the most statistically powerful study of paediatric CT scans undertaken to date, the EPI-CT study provides direct epidemiological evidence on the potential cancer risk from exposure to low doses of ionising radiation, and may help to limit the radiation dose delivered to children.



EPI-CT: Kick-off meeting, 7 to 8 February 2011, IARC, Lyon

The study is built upon and has expanded existing cohorts in France, Germany and the UK, and has led to the setting up of similar cohorts in Belgium, Denmark, the Netherlands, Norway, Spain and Sweden, based on a common protocol. Coordinated by the International Agency for Research on Cancer (IARC), the study has recruited over 1,000,000 patients.

National cohorts have been assembled retrospectively and prospectively from radiology department records. Cohort members have been followed passively through linkage with cancer, mortality and other registries (including hospital discharge databases), to determine the cancer incidence and vital status of study participants.

Dosimetric data for the distant past is extremely limited, and only sparse information could be obtained for dose reconstruction. For recent years, detailed dosimetric data has been extracted from the Picture Archiving Communication System (PACS) with the use of dedicated PerMoS software. NCI-CT software, which uses Monte-Carlo (MC) simulation methods, is used to calculate organ doses for the ICRP reference phantoms. Dose reconstruction strategy,



Cohort repartition

ID Card:

Database type: Individual data on humans exposed to protracted low-doses of ionising radiation
Cohort type: International cohort comprising 1,163,571 patients from BE, DK, FR, DE, NL, NO, ES, SE and GB, who have undergone CT examination.

Age/follow-up:
 - age at exposure: from 0 to 22 years
 - mean age at the first examination: 10 years,
 - mean age at the end of current follow-up: 20 years
 - follow-up period varies by country and ranges from 1973 to 2015

Data available:
 - Individual organ doses due to external X-ray irradiation, including uncertainty analysis;
 - cancer incidence;
 - vital status (except in Germany and partially in FR);
 - socioeconomic status available in BE, FR, NL, ES and GB
 - cancer predisposing syndromes available in FR, NL and NO.

Link with a biobank: no

Internet link:
<http://epi-ct.iarc.fr/>

Access:
 The data are maintained by each individual country; national principal investigators should be contacted.

Contact:
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 kesminienea@iarc.fr

Related to:
 MELODI, EURAMED

ASSESSING ORGAN DOSES FROM PAEDIATRIC CT SCANS – A NOVEL APPROACH FOR AN EPIDEMIOLOGY STUDY (THE EPI-CT STUDY)

Thierry-Chef I, Dabin J, Friberg EG, Hermen J, Istad TS, Jahnen A, Krille L, Lee C, Maccia C, Nordenskjöld A, Olerud HM, Rani K, Rehel JL, Simon SL, Struelens L, Kesminiene A. *Int J Environ Res Public Health*. 2013 Feb 18;10(2):717-28

EPI-CT: DESIGN, CHALLENGES AND EPIDEMIOLOGICAL METHODS OF AN INTERNATIONAL STUDY ON CANCER RISK AFTER PAEDIATRIC CT

Bosch de Basea M, Pearce M S, Kesminiene A, Bernier MO, Dabin J, Engels H, Hauptmann M, Krille L, Meulepas JM, Struelens L, Baatout S, Kaijser M, Maccia C, Jahnen A, Thierry-Chef I, Blettner M, Johansen C, Kjaerheim K, Nordenskjöld A, Olerud H, Salotti J A, Andersen T V, Vrijheid M, Cardis E. *Radiol Prot* 2015 Jul 30; 35(3):611-628



CATI

A large infrastructure for the neuroimaging of cohorts

CATI was born from the collaborative efforts of a consortium of neuroimaging research laboratories with complementary expertise: NeuroSpin (the French high-field MR imaging centre of the CEA) and four teams located at the Pitié-Salpêtrière Hospital: ARAMIS and CENIR (the neuroimaging analysis research team and the neuroimaging platform of the Brain

work can be expanded according to demand. In addition, 20 European sites will join the network starting from 2015. Although data accessibility policy is specifically chosen by the PI of each study, CATI aims to facilitate

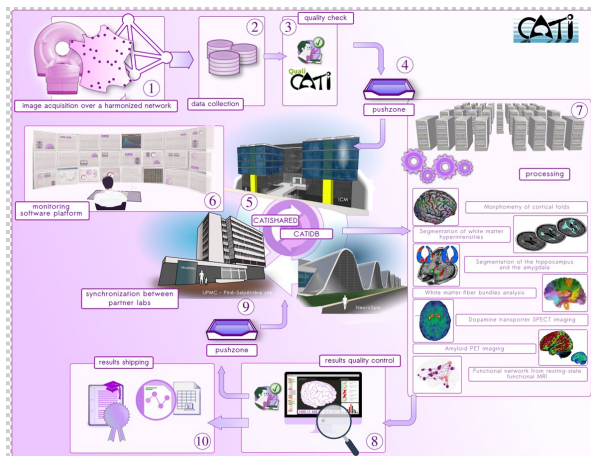


Photo: private source

Jean-François Mangin

data sharing across studies and to promote this as much as possible. The platform is currently responsible for the imaging protocols of more than 30 large French multicentre studies, including several therapeutic trials and the Memento cohort of the French Alzheimer initiative. Three European projects have also been using the platform since 2015. In the context of Memento, which images 2300 subjects with isolated memory complaints or mild cognitive impairment, CATI has close links with the French network of memory centres.

CATI embeds a team of MRI and PET physicists, engineers and researchers in charge of standardising acquisitions and monitoring MRI and PET scanners within the CATI network. The Keosys Company deals with the secure transfer of imaging data to the CATI central database through a web service that is accessible from imaging acquisition sites. A team of research assistants performs quality control of the incoming raw datasets. For data analysis, CATI provides broad expertise in image processing and statistical meta-analysis tools, which are operated by engineers and technicians. CATI can provide assistance at any stage of a study and can perform additional imaging harmonisation or dedicated algorithmic R&D for new facilities upon request.



CATI is a large infrastructure which seamlessly integrates a large network of imaging facilities and a very rich portfolio of image analysis pipelines.

and Spine Institute), the Institute for Memory and Alzheimer's disease (IM2A) and LIB (an Inserm/UPMC unit focusing on functional imaging research). These teams, who had been collaborating for several years, were granted EUR 9 million in 2011 by the French Alzheimer's disease initiative to create CATI, a national platform which aims to support multicentre neuroimaging studies. Services offered by CATI include the standardisation of MRI and PET/SPECT data acquisitions, the transfer of data to a centralised database, monitoring, quality control and image analysis. Initially designed to address the specific needs of Alzheimer's disease, the platform is now open to academic research projects and therapeutic trials targeting any neuropsychiatric disorder. The CATI infrastructure stretches across France, collecting additional know-how from all the French groups and organisations involved in neuroimaging, in order to offer the best tools for scientific projects.

In agreement with the French societies of Neuroradiology, Radiology and Nuclear Medicine, CATI currently harmonises imaging acquisitions across more than 40 French sites and this net-

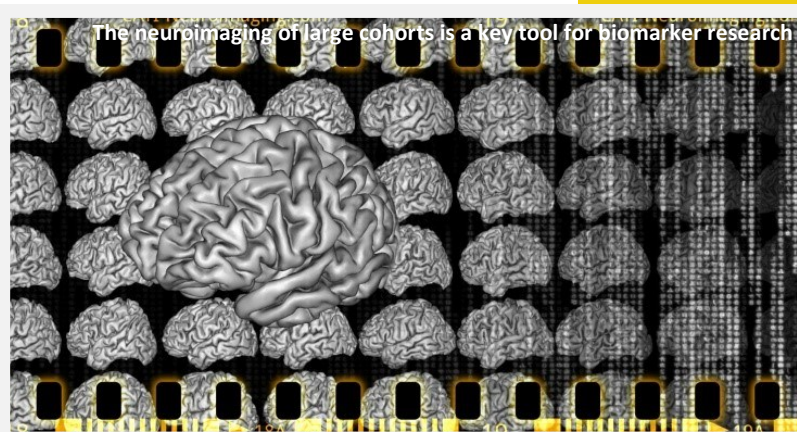


Photo: JF Mangin, Neurospin, CEA



ID Card:

Analytical platform type:
Neuroimaging

Main techniques proposed:
MRI (T1, T2, T2*, resting state, fMRI, ASL, diffusion, Melanine), PET (FDG, amyloid), SPECT (DATSCAN)

Capacity:
Up to several thousand patients per project

Waiting time:
A few months if using existing network facilities; 6 months if new facilities have to be harmonized

Duration of experiment:
Usually several years

Address:
Neurospin, CEA, 91191 Gif sur Yvette, France

Access:
Academic research projects and therapeutic trials – service fees apply

Internet link:
<http://CATI-neuroimaging.com>

Contact:
jfmangin@cea.fr

Related to:
MELODI, EURAMED

Future events:

5-7 Dec 2016: [8th EAN_{NORM}](#),
Stockholm, Sweden

27 Feb to 2 Mar 2017 :

[Eurados Annual Meeting](#)

KIT, Karlsruhe, Germany

25-27 April 2017:

[COMET final event](#), Bruges,
Belgium

14-19 May 2017: [Neutron
and Ion Dosimetry Symposi-
um, NEUDOS13](#), Krakow,
Poland

23-26 May 2017:

[Operra final event](#), Budapest,
Hungary

10-12 Oct 2017:

[Joint ICRP-RPW 2017](#), Paris,
France

Issue

Exposure platforms

Databases, Sample banks, Cohorts

Analytical platforms, Models & Tools

Published to date:

Issue	Exposure platforms	Databases, Sample banks, Cohorts	Analytical platforms, Models & Tools
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
Apr 2016, #6	Biological Irradiation Facility	Wildlife Transfer Database	Radiobiology and immunology platform (CTU-FBME)
May 2016, #7	CIRIL	Portuguese Tinea Capitis Cohort	LDRadStatsNet
Jun 2016, #8	Mixed alpha and X-ray exposure facility	Elfe Cohort	ERICA Tool
Jul 2016, #9	SCRS-GIG	RES3T	CROM-8
Sept 2016, #10	Facility radionuclides availability, transfer and migration	INWORKS cohort	France Génomique
Oct 2016 #11	LIBIS gamma low dose rate facility ISS	JANUS radiobiology ani- mal archive	The SCK CEN Genomics platform
Nov 2016, #12	Microtron laboratory	EPI-CT Scan cohort	CATI

Coming soon:

Dec 2016, #13	Nanoparticle Inhalation Facility	UEF Biobanking	The Analytical Platform of the PREPARE project
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