ANNUAL SCIENTIFIC REPORT 2010

EUROPEAN INSTITUTE FOR BIOMEDICAL IMAGING RESEARCH

EUROPEAN INSTITUTE
FOR BIOMEDICAL
IMAGING RESEARCH

Table of contents

Dear Network Members, Dear Colleagues, Dear Friends,

We are pleased to present to you the Annual Scientific Report 2010 of the European Institute for Biomedical Imaging Research. It provides a review of this year's activities and research projects and presents a first stock-take since the implementation of the new strategic plan, including the different service packages for our Network Members, as well as an outlook on planned activities and project-related events.

As announced in our previous report, a lot of changes in the structure and operations of EIBIR have been implemented this year. The network of scientific institutions has matured and the services provided have become more numerous and visible. Three categories of service package fees were introduced for our Network Members and we are pleased that around 100 institutions have already moved over to the new system. Of course change always takes time and we still have a lot of work ahead of us in terms of increasing the service level for our subscribing Network Members and communicating with those who have not yet decided on their future participation.

We are currently revising our member database and online members' area in order to reflect the different categories of service packages. In doing so, the functionality of the database will be improved and some additional fields related to site capabilities will be added. You are strongly encouraged to regularly update your institution data and imaging-related information online and to respond to our office's request to fill in the new fields. The more comprehensive and up-to-date our database, the more beneficial it will be when setting up new initiatives and the building of consortia for upcoming projects. In fact our analysis shows that the database is consulted frequently and scientific and industrial partners of our network are using it on a regular basis.

The Scientific Advisory Board was newly composed last year with the aim of generating a pro-active body that determines the scientific strategies of the coming years. The new board has reviewed a number of Network Member requests for support in grant proposal writing, offered support to European applicants for the RSNA seed grant programme and has held an electronic meeting to discuss priorities and initiatives for the coming year.

As you will be aware, the European Society of Radiology (ESR) has again provided significant financial support to EIBIR with a contribution of about EUR 150,000 to complement the support provided by our Industry Panel members, all of which we gratefully acknowledge. This has allowed us to invest in new projects, in particular the planning phase of Euro-BioImaging, which has been very intense and only received funding from the European Commission at the end of 2010. We are pleased that we were able to welcome a number of new companies as industry panel members during the year and very much hope that many more will realise the potential of EIBIR and join forces with our researchers to advance Europe's biomedical imaging research landscape.

And of course we would like to acknowledge our shareholder organisations who, with the adoption of the EIBIR guidelines, committed themselves to making a more active contribution to EIBIR and to making use of its services by spreading the word among their members. We look forward to their activity reportsat the next General Meeting, to be held during ECR 2011 in Vienna.

The following pages will provide you with detailed information from our project leaders and joint initiatives, of which we would like to mention just a few highlights here in our introduction:

We are pleased to report that the EIBIR Cancer Imaging Working Group has formalised this year and has joined forces with the corresponding ESR group to design a pan-European survey on oncologic imaging training that will be launched shortly. Members of the working group are contributing to the Innovative Medicines Initiative project QUIC-CONCEPT, initiated and co-ordinated by the EORTC.

The EuroAIM initiative, under its new leader Prof. Francesco Sardanelli, has established a European Working Group on evidence-based radiology that is highly active and will present its work at a dedicated session during ECR 2011.

In April, the FP7 project PEDDOSE.NET started under the co-ordination of EIBIR and has already made significant progress in evaluating potential health impacts of diagnostic imaging agent doses. Our two FP7 research projects that were started in 2008, the cell imaging project ENCITE and the breast cancer imaging project HAMAM, progressed well again during this year, with their second annual reports submitted to the European Commission and wide dissemination and training activities in place. In addition, EIBIR is very proud to have received acceptance of a COST Action on theranostics imaging and therapy in December.

EIBIR's experienced project staff have supported the European Society of Radiology in successfully applying for an EC Tender on radiation protection training. The tender brings together the main European stakeholders and professional groups relevant to radiation protection training in the medical field. The aim is to provide an improved implementation of the Medical Exposure Directive provisions relating to radiation protection education and the training of medical professionals in the EU Member States.

However, the focus of EIBIR's attention and resources has this year clearly been on Euro-BioImaging, the ESFRI research infrastructure project aiming to provide access to imaging technologies across the full scale of biological and medical applications, from molecule to patient. The project is scientifically co-ordinated by EIBIR (Medical Imaging) and EMBL (Biological Imaging) and its FP7 preparatory phase proposal has been scored by the European Commission (EC) as best among all infrastructure projects in the biomedical sciences field. The EC-funded three-year preparatory phase started in December 2010 with the aim of developing a plan to construct and operate a set of complementary and strongly interlinked infrastructure facilities distributed throughout Europe. The infrastructure project relies on the support and participation of Europe's biomedical imaging community. You are encouraged to visit the project website www.eurobioimaging.eu to learn about the mission and possibilities for participation and contribution.

We hope you enjoy reading the Annual Report and look forward to your active contribution to EIBIR's activities.

Gabriel Krestin
Chair of EIBIR General Meeting

Jürgen Hennig
EIBIR Scientific Director

First promising year with new network membership concept

In 2010, three different categories of EIBIR service packages for Network Members were introduced in order to ensure that EIBIR can continue offering high-quality services to its subscribers and to strengthen its role as facilitator of European biomedical imaging research.

While the constant improvement of facilities is a key aim, EIBIR is pleased to offer very concrete services to its member institutions. With a great number of Network Members supporting this strategy, one year after the implementation of the new concept EIBIR can proudly register a very positive balance:

The network totals 34 active, 41 regular and 6 associate Network Members both within and outside of Europe.

As part of the restructuring process and striving for continuous improvement of the services on offer, the EIBIR database will be revised in terms of contents, usability and design as well as within the application system. The clear display of the contents will make it easier for Network users to find their way around, as well as accessing principal data with just one click. In spring 2011, these new features will be available for all subscribed Network Members.

The overall feedback from EIBIR Network Members has been very reassuring and shows that the services offered by EIBIR close a gap and are much needed in the biomedical imaging landscape.

Prof. Lluís Donoso

'EIBIR will make it easier for us to obtain financing for our research projects at the European level. Participating in EIBIR's Euro-BioImaging has multiplied our opportunities to participate in multicentre and multidisciplinary projects. The EIBIR office provides remarkable value for a small investment.'

— Prof. Lluís Donoso, Hospital Clínic de Barcelona, Barcelona/ES
EIBIR active Network Member

Prof. Peter Aspelin

'For my institution it has already paid off being a member of the EIBIR Network. In Sweden, we have managed to find funding for two high profile projects. EIBIR was contributing by the fact that we already have the basic contacts and the way of acting in a network mode.'

— Prof. Peter Aspelin, Karolinska University, Stockholm/SE
EIBIR active Network Member

EIBIR Service Packages

Active Service Package € 1,000 per year

This package is intended for all research institutions taking part or intending to take part in one or more research projects co-ordinated by EIBIR.

It becomes applicable as of approval of the project idea and support in proposal writing by the Scientific Advisory Board or from the moment the Network member joins a consortium co-ordinated by EIBIR. Within this service package, the services described below are without additional cost, including professional support in proposal writing, the organisation and management of the funding application phase, incl. project planning meetings etc.

After the end of the project or in case of unsuccessful application, it is possible to downgrade to the Regular Service Package. Network members who subscribe to the Active Service Package on a permanent basis enjoy continuous eligibility for support in proposal writing and project management.

Services include
Entitlement to participate in research projects coordinated by EIBIR
Eligibility to become a member of the EIBIR Scientific Advisory Board (upon nomination by the Scientific Director and appointment by the General Meeting)
EIBIR support in consortium composition, proposal writing and project management of new proposed research projects upon approval by the EIBIR Scientific Advisory Board at no additional cost
Access to the online directory of EIBIR Network institutions (currently 280 research institutions, listing detailed fields of expertise, equipment used, assessment studies etc.)
Possibility of posting training events and job openings on the EIBIR website
Regular information and updates on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers
Possibility of participating in EIBIR's topic-oriented initiatives such as image processing, cellular imaging, the probe development platform, the cancer imaging working group etc. as well as to propose the launch of new initiatives to the Scientific Director
Exchange and dissemination of good practice
Use of EIBIR umbrella and label for the submission of research proposals to funding institutions, e.g. at the national level, and option to apply for EIBIR support in project management etc.

Regular Service Package € 200 per year

This package is intended for all research institutions that are interested in an active participation in the EIBIR Network.

Services include
Eligibility to become a member of the EIBIR Scientific Advisory Board (upon nomination by the Scientific Director and appointment by the General Meeting)
Access to the online directory of EIBIR Network institutions (currently 280 research institutions, listing detailed fields of expertise, equipment used, assessment studies etc.)
Possibility of posting training events and job openings on the EIBIR website
Regular information and updates on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers
Possibility of participating in EIBIR's topic-oriented initiatives such as image processing, cellular imaging, the probe development platform, the cancer imaging working group etc. as well as to propose the launch of new initiatives to the Scientific Director
Exchange and dissemination of good practice
Use of EIBIR umbrella and label for the submission of research proposals to funding institutions e.g. at the national level

Associate Service Package € 100 per year

This package is intended for research institutions that wish to be informed about EIBIR's activities, but for the moment do not intend to play an active role in EIBIR's initiatives and projects. In case of more active involvement, an upgrade to other packages is possible.

Services include
Access to the online directory of EIBIR Network institutions (currently 280 research institutions, listing detailed fields of expertise, equipment used, assessment studies etc.)
Possibility of posting training events and job openings on the EIBIR website
Regular information and update on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers

Shareholder organisations are pointing the way ahead

EIBIR is very pleased to welcome the Cardiovascular and Interventional Radiological Society of Europe as a new shareholder organisation. In addition, the European Society for the Promotion of Picture Archiving and Communication Systems in Medicine (EuroPACS) has also expressed strong interest in joining EIBIR, and negotiations are underway.

The multidisciplinary profile of the currently six shareholder organisations demonstrates the need for co-operation to harmonise and complement research agendas in order to be able to mobilise funding from European research programmes. EIBIR would like to encourage its shareholder organisations both to make use of its services and office infrastructure and to pass on information to their institutional members. EIBIR's experienced project management staff are available to help the shareholder organisations get their projects underway and to lend their expertise in terms of project co-ordination and management.

The shareholder organisations play a key role in pointing the way in EIBIR's future development and it is vital that they identify themselves with the EIBIR mission and recognise their role as multipliers to promote the network and spread the word about its services. This includes informing their own members about EIBIR and providing regular updates on the network's activities/projects etc.

Shareholders are represented at the General Meetings of EIBIR, where major strategic decisions are taken and recommendations are developed for the other bodies and EIBIR initiatives, and where each shareholder organisation presents a report on its EIBIR-related activities. Shareholders are invited to nominate a representative to the network's Scientific Advisory Board who has the standing and resources to contribute to the development of EIBIR's scientific strategy. During the last year, co-operation between the organisations has been intensified, and EIBIR encourages its shareholders to provide further pro-active suggestions regarding further enhancement of interaction and participation in the networking activities.

We are pleased that many of EIBIR's shareholder organisations, including CIRSE, EANM and EFOMP, are represented in the multidisciplinary consortium headed by the European Society of Radiology that successfully applied for an EC Tender on radiation protection training. The consortium has just recently received the award notification from the European Commission and will aim to further improve implementation of the Medical Exposure Directive provisions related to radiation protection education and training of medical professionals in the EU Member States. The writing of the bid was co-ordinated by EIBIR staff and work will start in 2011.

CIRSE

www.cirse.org

Quality begins with research. CIRSE's journey to quality has only one target in mind: the patient. To offer the patient the most appropriate prevention and treatment options whilst applying best medical practice requires thorough and well-executed research. Today, CIRSE boasts an active and pivotal role in medical and clinical research within image-guided minimally invasive therapy. Registries are being conducted in areas such as Uterine Fibroid Embolisation, Closure Devices, Carotid Stenting, Vertebroplasty and Inferior Vena Cava Filters, in co-operation with our colleagues from SIR (Society of Interventional Radiology, North America). These and our numerous other research activities adhere to the highest standards in quality and care, compiled and devised by specially selected experts. In terms of its involvement in EIBIR, CIRSE endeavours to coordinate further activities with regards to EU funding and medical and clinical research by providing dedication, expertise and appropriate forums to support the dissemination of information. We look forward to a healthy future.'

— Prof. Jim A. Reekers, CIRSE

COCIR

www.cocir.org

The European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry (COCIR) is pleased to be a shareholder organisation of EIBIR since the beginning. COCIR members looks forward to their continuous involvement. COCIR fully support the mission of EIBIR. COCIR, actively involved in research programmes through its members, supports the European biomedical imaging research activities, including common strategies and priorities. It will enable the European research community to focus on the challenges of unmet clinical need and faster adoption of innovative technologies, leading to better and affordable health-care for EU citizens.

— Heinrich von Wulfen, COCIR President

Prof. Christian J. Herold

'EIBIR is the most impressive and relevant initiative for radiology research in Europe ever. For our institution, EIBIR is very important because it facilitates and supports co-operation with other research institutions and research groups on an international level and stimulates molecular biology and research projects focusing on basic, translational and clinical science.'

— Prof. Christian J. Herold, Medical University Vienna/AT
EIBIR active Network Member

EANM www.eanm.org

'In 2010 the EANM, as co-shareholder of EIBIR, participated in the following EIBIR projects: In June EANM co-operated with various other organizations in putting together in record time a tender for DG Energy concerning "Study on the Implementation of the Medical Exposures Directive's Requirements on Radiation Protection Training of Medical Professionals in the European Union". We are very happy that the tender was successful and look forward to future collaboration in this project. Furthermore, EANM has been and is a fully supportive partner in the FP7 EU project PEDDOSE.NET, a consortium of five European partners. In this project a systematic scientific evaluation of the available data on radiopharmaceuticals with particular emphasis on pediatric nuclear medicine is undertaken. The aim is to provide recommendations on a patient-specific dosage when applying radiopharmaceuticals for diagnostic purposes. In addition, strategies for dose reduction of hybrid systems such as PET/CT or SPECT/CT particular with respect to pediatric patients will be developed.'

— Andrea Bauer, EANM

EFOMP www.efomp.org

'Interfaces between EIBIR and the European Federation of Organisations for Medical Physics (EFOMP) have been identified e.g. in the fields of magnetic resonance imaging, contrast agents, nuclear medicine, radiotherapy and dosimetry. Both organisations benefit from an increased interaction via the two-way alternate flow of information, the mutual promotion of scientific and educational events and the establishment of an EIBIR joint initiative with respect to current EFOMP subjects. The following key words related to the newest focus topics within EFOMP and the medical physics community in Europe may be defined: MRI-Magnetic resonance imaging; higher magnetic field strength; contrast agents; SNR; resolution; nanotechnology, nanoparticle; nuclear medicine, medical/biomedical engineering; radiation; radiotherapy; dosimetry; education and training; policy and scientific issues. Under the supervision of the Science Committee a number of Special Interest Groups will be created in order to provide Medical Physicists with similar interests with a forum to discuss and organise meetings to advance these interests. EFOMP has created a Projects Committee responsible to the Council of the Federation for participating in the implementation of projects and supporting the participation of Medical Physics institutions for improving research in Medical Physics.'

— Dr. Alberto Torresin, EFOMP

EORTC www.eortc.be

'The EORTC Imaging Group (IG) operates to establish and maintain the scientific and clinical value of advanced imaging for cancer treatment clinical trials. Moreover, the IG has and will develop specific analytical and review procedures as well as quality control procedures, in the context of clinical trials conducted by the EORTC groups. The IG held its first meeting in January 2010, with participations of several EIBIR members. A consortium led by EORTC in co-operation with EIBIR was selected to develop a full proposal for the MI initiative "imaging biomarkers in cancer treatment". EORTC is also participating in the preparation phase of the Euro-BioImaging EU infrastructure project. EORTC collaboration with the EIBIR through their cancer imaging working group promises to be mutually beneficial.'

— Dr. Jocelyne Flament, EORTC

ESMRMB www.esmrmb.org

'The European Society for Magnetic Resonance in Medicine and Biology (ESMRMB) is pleased to be a shareholder organisation of EIBIR. Leading ESMRMB representatives have been actively involved in the activities of EIBIR right from the beginning. Magnetic resonance imaging for example plays a key role in the ENCITE project co-ordinated by EIBIR, in which novel imaging tools in cellular therapy are developed and implemented. The European MR community also looks forward to its involvement in the Euro-BioImaging infrastructure project, where high-field MRI is a key part of one of the work packages dedicated to medical imaging. In addition, ESMRMB encourages and supports its members to proposing and/or being involved in future research projects on a European level. And with EFOMP also being a shareholder organisation we have the opportunity to extend our co-operation from the field of education to also include common research activities and strategies. The ESMRMB membership has been encouraged to propose new ideas for EIBIR initiatives and we hope that we see many exciting projects develop in the near future.'

— Prof. Oliver Speck, ESMRMB

EIBIR appreciates strong partnerships with the industry

The year 2010 has been a year of change for EIBIR, and the revision of its strategy and the replacement of the former industry support payments proved to be a step into the right direction.

As part of the strategic plan 2010 – 2012, three service packages involving different service levels and different financial commitment were introduced starting in 2010. The reduced amount of support per company attracted several new companies.

The members of the EIBIR Industry Panel meet annually and contribute to EIBIR's strategic plan as well as report on their companies' expectations and needs with regard to their membership of EIBIR.

Supporting companies have the opportunity to approach the EIBIR Scientific Advisory Board and request assistance in the early stages of industrial development in order to translate new discoveries into industrial innovation. EIBIR Industry Partners have the possibility of participating in the EIBIR Joint Initiatives and actively shaping their content. In addition, the supporting companies are granted access to the restricted members' areas of the EIBIR website, those providing an overview of the various fields of expertise, including types of equipment used, and contact details of all EIBIR member institutions etc.

For application to join the EIBIR Industry Panel, please contact: office@eibir.org

The infrastructure project Euro-BioImaging, scientifically co-ordinated by EIBIR and EMBL, recognises that imaging hardware and software vendors are a critical component of the imaging community. A close collaboration on planning the implementation of the research infrastructure and the exchange of knowledge and experience will maximise the profits for both, Euro-BioImaging and participating companies. Therefore, Euro-BioImaging has invited vendors and producers of biomedical imaging equipment to take part in the Preparatory Phase Project. A dedicated industry board composed of imaging technology developer companies will ensure adequate involvement of this essential stakeholder group.

Conferences with the objective of developing interactions will be organised coincident with the Stakeholder Meetings. In 2010, EIBIR hosted the 1st "Euro-BioImaging Industry Meeting" on 21 October in Vienna. A summary report is available at www.eurobioimaging.eu.

EIBIR strongly appreciates the commitment and support of its Industry Panel members and welcomes Carestream, Hitachi Medical Systems, Barco and Novartis as new members.

Gold Package: Bayer Schering, Bracco, GE Healthcare, Philips and Siemens

Silver Package: Barco, Carestream, Hitachi Medical Systems and Novartis

Counting on the support of a total of nine Industry Partners, EIBIR looks forward to a successful co-operation in the coming years!

The new concept and broader liaison with the industry allows identifying joint interests and possibilities of co-operation in order to establish a sound, long-standing partnership that is of mutual benefit and at the same time serves the European research landscape.

In the following you will read how our Industry Panel members clearly see the synergies between their research activities and EIBIR's mission.

Prof. Mário A. Barbosa

'INEB's strong expertise in Biomaterials and Bioimaging makes it a unique Centre at the European level operating in the field of Regenerative Medicine. By joining EIBIR we expect that the establishment of new contacts and collaborations with other members sharing our interests and challenges in the biomedical imaging and pre-clinical studies domains will be facilitated. We see the network as a privileged forum for the exchange of pivotal information and search of opportunities in the domain of biomedical imaging.'

— Prof. Mário A. Barbosa, Instituto de Engenharia Biomédica, Porto/PT
EIBIR active Network Member

Industry Service Packages

Industry service packages are available in three different categories, involving different service levels and different financial commitment.

Gold package EUR 10,000 per year

Bayer HealthCare Bayer Schering Pharma

GE Healthcare

SIEMENS

BRACCO

PHILIPS

This category includes the following services:
1 representative on the EIBIR Industry Panel, regular meetings and direct exchange with key representatives of EIBIR
Access to the online directory of EIBIR Network institutions (currently 280 research institutions, listing detailed fields of expertise, equipment used, assessment studies etc.)
Listed as supporting company on the EIBIR website
1/2 page research-related advertorial in the EIBIR Annual Scientific Report
Regular information and updates on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers
Eligibility for participation in research projects co-ordinated by EIBIR

Silver package EUR 5,000 per year

BARCO

HITACHI Inspire the Next

Carestream Molecular Imaging

NOVARTIS

This category includes the following services:
1 representative on the EIBIR Industry Panel, regular meetings and direct exchange with key representatives of EIBIR
Listed as supporting company on the EIBIR website
Regular information and updates on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers
Eligibility for participation in research projects co-ordinated by EIBIR

Bronze package EUR 1,000 per year

This category is reserved for companies with SME status according to EC definition, and includes the following services:
1 representative on the EIBIR Industry Panel, regular meetings and direct exchange with key representatives of EIBIR
Listed as supporting member on the EIBIR website
Regular information and updates on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers

Industry supports EIBIR in its endeavours to achieve the mission of the network

'Barco develops high-precision medical display systems to bring accuracy and efficiency to a broad range of healthcare disciplines, including radiology, mammography, surgery and clinical review imaging. Barco continuously invests in R&D and collaborates with universities throughout Europe. Current research topics include improved display calibration, 3D displays and mobile point of care displays.

Related to display calibration, research is being performed to develop calibration algorithms for medical colour displays. Goal is to optimize colour visualization of medical colour displays such that highest possible image quality and highest possible clinical performance can be achieved with the display (e.g. for pathology, surgery and cardiac applications).

Research on medical stereoscopic displays (3D displays) could result into a high quality medical 3D display that can be used e.g. during surgical procedures. Such 3D display has the potential to decrease time of surgical procedures while at the same time increasing accuracy and quality of these procedures.

Finally, we are looking into medical mobile point of care displays to enable better and more efficient workflow in hospitals. This should make it possible for hospitals transfer from a paper-centric to a paperless workflow.'

— Tom Kimpe, BARCO,
Chief Technology Officer of the Medical Imaging Division, Kortrijk/BE

Dr. Ralf Hendrik Menk

'Through its user programme Sincrotrone can provide access to its imaging technologies for EIBIR Network Members thus creating a valuable, inter-disciplinary research environment for complementary imaging methods on different length scales. Such collaboration certainly gains mutual scientific benefits also in the light of Euro-BioImaging and might, on the long run, improve diagnosis, therapies and prevention of diseases.'

— Dr. Ralf Hendrik Menk, Sincrotrone Trieste/IT
EIBIR active Network Member

'Carestream Molecular Imaging's line of products enables scientists to identify key biological processes, such as cellular abnormalities, that may be the origin of disease at a very early stage. In thousands of labs worldwide, our customers are studying biological molecules (DNA, RNA and proteins) and cellular activity in vitro (within test tubes or controlled environments) and in vivo (within a living system).

Every lab is unique. Each has its own needs regarding the spectrum of image analysis performed, workflow requirements, size of sample work area, budget parameters, etc. We offer a revolutionary new PET/SPECT/CT system specifically for small animal imaging that has a highly compact, multimodal design and unique, patented detector technology for exquisite sensitivity and high resolution images.

Carestream's In-Vivo Imaging Systems allow you to choose the one system that best meets your particular imaging needs. Each system combines high sensitivity optical imaging and high-resolution digital X-ray in a single, multimodal system, allowing for unmatched versatility, superior image quality and streamlined workflow. Images are available in multi-wavelength fluorescent, radioisotopic, luminescent, and X-ray modes to improve the anatomical localization of biomarkers in vivo.

We also offer a full line of In Vitro imaging systems: from basic gel documentation instrumentation, to high end systems for imaging fluorescent, chemiluminescent, chromogenic, and high energy radioisotopic labels in gels, blots, plates and more. Carestream's Molecular Imaging – Your one source for complete molecular imaging solutions –

Learn more at mi.carestreamhealth.com.'

— Merrill Loechner, Carestream Molecular Imaging, Marketing Development Manager, Woodbridge/USA

Prof. Jarle Rørvik

'Imaging research is development of advanced technology by sophisticated methods. Through EIBIR our researcher may get in contact with other research-groups that use the same methods. Formal co-operation with EIBIR will strengthen grants application.'

— Prof. Jarle Rørvik, University of Bergen/NO
EIBIR active Network Member

The project "Defeating cancer by intelligent imaging" is aimed to image human stem cells (normal and cancerous), and thereby facilitate novel cancer detection and treatment. It is likely that the survival of cancer stem cells despite treatment with cytotoxics and radiation treatment may lead to relapse and eventual death of cancer patients. Visualizing those stem cells in vitro and in-vivo, could be the next important improvement in patient care. Specific antibodies will be raised against those molecules, thought to be characteristic of putative stem-cells, they will then be labeled by 68Ga, and taken through established pre-clinical development to hypothesis driven Phase 0 and 1 "first-in-man" studies using PET imaging. The labeling and imaging of the Cancer Stem Cells will be developed by the Uppsala Applied Science Lab, GE Healthcare and applied into humans at IEO, Milan.

Since the beginning of the study, considerable success has been achieved in the unravelling of some key genetic mechanisms responsible for the origin and behaviour of cancer stem cells. Also a gene signature has been established for normal breast stem cells and human cancers of ovary, lung and brain respectively. The therapeutic consequence is that inhibiting that DNA repair mechanisms might eradicate slowly proliferating cancerous stem cells. The tumour suppressor gene P53 is important as two related genes, numb and notch have already been shown at IEO to be intimately related to cancer stem cell function. Usefulness as an imaging biomarker is being evaluated. Using the international database of gene signatures in patients followed up for five to ten years indicates that the IEO signature will identify groups of women who have good, intermediate or poor prognoses. More validation is required before clinical application will be possible.

— Gordon McVie, IEO, Milan and Bengt Nielsen, GE Healthcare

Bayer Schering Pharma is the global market leader in contrast media for classic X-ray procedures, computed tomography and magnetic resonance imaging (MRI) and has provided innovations in the field of diagnostic imaging since the early 30ies.

Innovations in the field of equipment, scanners and IT technology will give us an opportunity to venture into new indications and provide more precise information even faster using established diagnostic procedures.

The latest generation of scanners for computed tomography and magnetic resonance imaging are continuously improving the three-dimensional and temporal resolution of image generation. These advances will for example further boost the importance of CT-based angiography as a fast and inexpensive method that is less invasive than catheter examinations.
Lower radiation exposure is also a field that is being explored more and more.

Furthermore, hybrid scanners which combine CT (or MRI in the future) with PET will decisively influence the diagnostics of the future. Among other things, these technologies will allow a precise localization and characterization even of small and very small tumours or metastases. The advantages are evident: the earlier and more precise the diagnosis, the better a condition can be treated. Conversely, this means that in future treatments will only be started if an indication has been correspondingly confirmed and there is a justified prospect of the chosen therapy having an effect. This spares patients unnecessary stress. And, of course, it is also an important financial advantage for the healthcare systems, as money can be spent on cases where the treatment is going to be effective.

Bayer Schering Pharma is currently developing a specific molecular tracer which might support a better and possibly earlier classification of dementia diseases such as Alzheimer's. The tracer binds specifically to amyloid plaques in the brain which are a typical hallmark of Alzheimer's disease. Other tracers for use in oncology indications are in early research/development phases. As the world market leader and a company that has been advancing diagnostic imaging through innovation for 80 years – it is our ambition to push the frontiers in Diagnostic Imaging, today and tomorrow.'

— Prof. Hans Maier, Bayer Schering Pharma, Head of Global Bussiness Unit Diagnostic Imaging, Berlin/DE

Prof. Robert Muller

'As a chemist involved in preclinical molecular imaging research, I appreciated the momentum brought by EIBIR in networking groups of complementary specialities and various origins. This effort has led to the initiation of important EU programs and actions among which ENCITE, COST and Euro-BioImaging. Daily, I enjoy the administrative efficiency of EIBIR and its invaluable support to science.'

— Prof. Robert Muller, University of Mons/BE
EIBIR active Network Member

Dr. Luis Martí-Bonmati

'EIBIR is of great interest to our institution, as we have now the possibility to access centralized knowledge of other groups' interests and research lines. The joint initiatives and the projects promoted by EIBIR are a very interesting pool to know what the current and future real interests of Biomedical Imaging research are.'

— Dr. Luis Martí-Bonmati, Hospital Quirón, Valencia/ES
EIBIR active Network Member

Prof. Paul Suetens

'EIBIR opens the door to Europe for us. The EIBIR management is a highly professional team, which takes several new European initiatives and performs their co-ordination. We are involved in several activities of Euro-BioImaging; the Biomedical Image Analysis Platform; the EIBIR Summer School on Biomedical Image Analysis and the IMAGINE Workshop at ECR.'

— Prof. Paul Suetens, Katholieke Universiteit Leuven, Leuven/BE
EIBIR active Network Member

Hitachi Medical Systems Europe is the European headquarters of Hitachi Medical Corporation whose corporate head offices are located in Tokyo, Japan; a company renowned for technological innovation. Hitachi Medical is an integrated medical systems manufacturer involved in every aspect of the medical equipment and medical information systems business from R&D, manufacturing, sales and service.

Having the impact of cutting-edge technological expertise of the Hitachi Group, Hitachi Medical Systems provides a broad experience and expertise in diagnostic imaging systems, ranging from magnetic resonance imaging (MRI) systems with a truly open architecture and X-ray computerized tomography (CT) systems that cause less exposure as well as award-winning diagnostic ultrasound systems, all of them meeting the latest design and quality standards, delivering outstanding image quality, offering advanced clinical application capabilities and maximum patient-friendliness.

In the area of image fusion, Hitachi Medical is coming up with an attractive technology, the Hitachi Real-time Virtual Sonography (HI RVS). The software utilises magnetic position tracking sensors on the ultrasound transducer (real-time virtual sonography magnetic sensors) to display real-time free-hand ultrasound images alongside synchronous CT or MR images. Correlating anatomical cross-sections can be viewed at any position and angle of the transducer in accordance with the previously acquired and stored CT or MR volume data set.

In MR and CT, the company provides a range of innovative technologies to enhance image quality, all of them contributing to deliver a high level of diagnostic confidence. In Ultrasound, Hitachi Medical is inspiring the medical audience with its Hitachi Real-time Tissue Elastography (HI-RTE), an exciting technique which allows assessment and real-time colour display of tissue elasticity to improve the differentiation of benign and malignant disease.

Hitachi Medical Systems places value on quality, reliability, responsibility, service and long-term relationships that refers to all its actions in order to offer peace of mind to all our clients and stakeholders around the globe so that the next generation has a firm grounding on which to build a secure future.

— Hitachi Medical Systems Europe Holding AG, Zug/CH

Biomedical Image Analysis Platform boosts biomedical image analysis research through various activities

The mission of the Biomedical Image Analysis Platform (BioMedIA) is to represent biomedical image analysis research on a European and international scale and to establish educational activities in that field.

The group launched the EIBIR School on interdisciplinary biomedical imaging for technical and clinical PhD students. After the first very successful course in 2009, the next school will be held in Dubrovnik/Croatia from 21 – 26 August 2011. Each year different topics are covered, with this year's thematic focus being on quantitative neuro-imaging. The faculty consists of an international team with a clinical, biomedical and technical background, from both academia and industry. In addition, the offered reading groups, poster sessions and social activities are very well received, being significant components of the schools to foster collaboration and exchange.

Furthermore, the joint initiative has revitalised the well-known IMAGINE exhibition at the European Congress of Radiology (ECR). At the ECR 2011, the exhibition will proceed with a new concept combining scientific presentations, guided tours through the exhibition and walk-in sessions. Under the title "EIBIR presents: IMAGINE workshops", research institutes, university groups and research departments of industrial companies have the opportunity to present novel and exciting technological developments in the field of diagnostic and interventional radiology. This new concept provides a platform to discuss the potential of these techniques for the future of radiology with the people that are creating them.

The Biomedical Image Analysis Platform is also actively contributing to the European research infrastructure project Euro-BioImaging, in which image processing and data management will be key aspects of the work programme (see p. 24)

For more information please contact: office@eibir.org

Prof. Wiro Niessen
—
Director of the Biomedical Image Analysis Platform

First steps foster fruitful collaboration between working groups on cancer imaging

As cancer imaging plays an increasingly important role in modern healthcare, EIBIR has decided to set up a dedicated Cancer Imaging Working Group, involving experts from the fields of radiology, nuclear medicine and image processing. The group was established in March 2010 to meet the interdisciplinary challenges of cancer imaging and to foster collaboration in that field. The key issue will be to explore the possibilities of co-operations on a national and international level focusing on specific actions within translational and fundamental research. The EIBIR group attaches great importance to intense collaboration, to information exchange and to establishing a detailed overview of existing working groups in the field of cancer imaging. It therefore has already started a co-operation with two European working groups:

The ESR Cancer Imaging Group, a political working group established by the European Society of Radiology, has drawn up a survey on oncologic radiology/cancer imaging in Europe targeted at national societies. The aim of this survey is to gather information on training in everyday practice in cancer imaging. The EIBIR working group has contributed to the survey and added particular questions related to cancer research, such as the identification of research groups in Europe and their main focus, their most common research fields and their involvement in clinical cancer imaging trials.

The EORTC Imaging Working Group, set up by the European Organisation for Research and Treatment of Cancer, deals with clinical imaging with a focus on the establishment of protocols for clinical trials. Representatives of the EIBIR working group participate in the meetings of the EORTC group with the thought of identifying common approaches and cross-fertilising ideas.

There is a lot of space for showing the potential and the usefulness of imaging, for marketing new imaging tools, such as DCE MRI, MRI diffusion, spectroscopy and other technologies as well as for conducting research trials to establish benefits for these tools.

Next steps for concrete actions within the work programme for the upcoming year will be discussed at the working group meeting in Vienna at ECR 2011.

Are you interested in being part of a joint action?
Please contact: office@eibir.org.

Dr. Peter Brader
—
Director of the Cancer Imaging Working Group

EuroAIM — Why is evidence-based radiology crucial?

The European Network for the Assessment of Imaging in Medicine (EuroAIM) has been established to assess radiological technology and the evidence for its best use in clinical practice.

Within this network, the European Working Group On Evidence-Based Radiology (EBR WG) **will pay attention to the following three fundamental statements: (1) ethics: to do the best for patients (2) economics: to avoid unnecessary imaging exams, save money, reduce radiation exposure (3) professionalism: to keep EBR within the radiologists' remit.** The key focus of the working group's activities is to:

1. Assess which radiological topics are covered by systematic review/meta-analyses and which are still uncovered;
2. Assess which radiological topics uncovered do have enough original primary studies to be meta-analysed;
3. Select relevant topics on which primary studies are available but lack systematic reviews and meta-analyses;
4. Create an EBR group for the younger generation with web-based educational aims.

Within a systematic literature research, secondary studies published (01/2000-04/2010) were selected according to the following inclusion criteria: (1) involve at least one of the imaging modalities, incl. interventional diagnostic/therapeutic procedures and nuclear medicine tests (2) in English (3) regarding humans (4) with an available abstract.

As a result, 1,448 papers met the criteria with the following topics: diagnostic imaging procedures (56%); interventional procedures performed by radiology/nuclear medicine specialists (3%); diagnostic imaging (17%) or interventional procedures (11%) performed by non-radiology physicians and nuclear medicine specialists respectively; estimation of a treatment effect using diagnostic imaging or interventional procedures as a surrogate end-point (13%). As a matter of fact, there is a clear underrepresentation of secondary radiological studies, and the role and number of radiologists as authors as well as the publishing journal should be investigated.

(Non-)European radiologists and residents are welcome to join the EBR Working Group!

For more information please contact: office@eibir.org

Prof. Francesco Sardanelli
—
Director of EuroAIM

First COST Action accepted within the Chemistry Platform

Within the framework of the Chemistry Platform, EIBIR submitted a COST Action on 'Theranostics imaging and therapy: an Action to develop novel nanosized systems for imaging-guided drug delivery', under the leadership of Prof. Silvio Aime, University of Torino/Italy.

EIBIR is very proud to have received acceptance of this Action in December 2010. The main objective of the Action is to exploit nanotechnology advances in pharmaceutical and biomedical imaging fields to develop innovative image-guided therapies for the cure of diseases with a high social impact **(see p. 26).**

The Chemistry Platform was formed by a core group of 5 top-class European research teams in the field of probe development for the different imaging modalities. The Platform will grow through gathering highly qualified laboratories with well documented skills in developing imaging probes for medical applications and thus strengthen the liaison between basic research and biological and clinically oriented groups. The key goals of the platform are:

— to support EIBIR activities with highly skilled teams in the design and fabrication of innovative imaging probes;

— to offer EIBIR members access to specialised equipment for the physico-chemical characterisation of probes/new formulations developed in the core laboratories;

Pre-clinical collaborations will support the focus of this initiative in order to explore new applications in the field of physico-chemical probes. The Chemistry Platform plans to offer EIBIR Network Members the access to specialised equipment for physico-chemical characterisation of probes.

Are you interested in participating actively in this platform?
Please contact: office@eibir.org

Prof. Silvio Aime
—
Director of the
Chemistry Platform

ENCITE — In search of the best visible cell therapies in modern medicine

In order to address the extreme variety of cell therapies on generic and disease-oriented levels, the European Network for Cell Imaging and tracking expertise (ENCITE) has seen the birth of an extensive collaboration of experts for the development and implementation of novel imaging tools in cellular therapy.

Several working groups from different disciplines (physics, chemistry, biology, informatics, endocrinology, immunology, neurology, nuclear medicine, radiology) are involved and have joined forces to benefit from each other's expertise and thereby expedite the translation and implementation of novel techniques and tools into the clinic.

After nearly three years, ENCITE, co-funded by the European Comission under the Seventh Framework program, is extremely proud to present major developments:

New imaging methods, post-processing and visualisation tools and much more

Under the leadership of the University of Freiburg/DE, there is a close co-operation with the partners Westfälische Wilhelms-Universität Münster/DE and the University of Basel/CH for new pulse sequences as well as Erasmus Universitair Medisch Centrum Rotterdam/NL for the image post-processing research work.

Methodologies for cell tracking including imaging methods for specific contrast agents and new biomarkers to monitor cell fate were developed and optimised. Further developments include methods for a meaningful integration and post-processing of imaging data (molecular, functional and anatomical data). MR-based cell tracking was implemented; methods for pre-clinical drug evaluation were optimised. 3D and 4D MRI datasets from the brain and heart, generated under various conditions, form the backbone of the new, publicly available mouse and rat atlases.

New MRI reporter probes provide a more comprehensive picture of molecular imaging applications

The joint efforts of the participating teams (University of Mons/BE, Cage Chemicals/IT, Katholieke Universiteit Leuven/BE, Weizmann/IL, Max-Planck-Institut/DE, Radboud University of Nijmegen/NL, BioSpace/FR, University of Cambridge/UK) are addressing relevant issues in the field of cellular labelling.

High-sensitivity paramagnetic Gd-based probes have been designed and tested, and innovative concepts for imaging-responsive agents have been conceived. Privileged target applications are in the field of stem cells and imaging reporters of gene expression.

As a start towards targeting, a process was developed to coat gram-amounts of iron oxide particles for use in binding. Constructs with optical and MRI reporter genes were developed. A bicistronic vector was generated and introduced into embryonic stem cells. CMV-HA-ferritin-IRES-fLuc was stably expressed in a human glioblastoma line.

A considerable number of high-quality papers could be drafted thanks to the joint and very intense collaboration between the partners.

Prof. Gabriel Krestin

'My initial fear was that the scientific co-ordination of such a challenging and complex project like ENCITE, with many partners from very different disciplines, would become a nightmare. In reality, however, due to the excellence and enthusiasm of all participating scientists and the professional guidance and management skills of the EIBIR office, the duties of the co-ordinator are simple and rewarding. It is a pride and pleasure to be part of such a successful endeavour.'

— Prof. Gabriel Krestin, ENCITE Scientific Co-ordinator, Rotterdam/NL

Prof. Klaus Scheffler

'EIBIR offers a platform to find and communicate with partners with related as well as complementary research interests, gives updates on interesting meetings, workshops and courses, and provides a possibility for promotion.'

— Prof. Klaus Scheffler, University of Basel Hospital, Basel/CH
EIBIR active Network Member

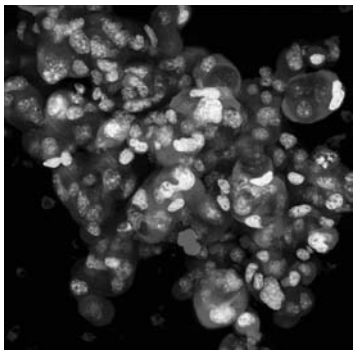


Fig.1a:
Cytotoxic T lymphocytes (blue) attacking a tumour (red cells with green/yellow nuclei) in an in vitro three-dimensional culture model

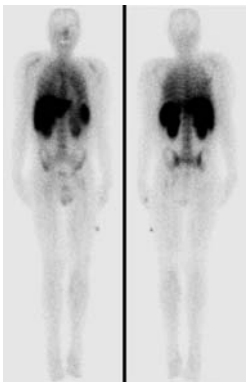


Fig.1b:
Detection of Indium111 labelled immunopotent DC after intravenous application in lung, liver, spleen, kidney and bone marrow

Novel tools for cell labelling

Close interactions successfully shape the co-operative research work of Weizmann Institute/IL, Erasmus/NL, Max-Planck Institut/DE, University of Torino/IT, Fundación Para La Investigación Médica Aplicada/ES University of Paris-Descartes/FR, BioSpace/FR and Agencia Estatal Consejo Superior de Investigaciones Científicas/ES.

Apoptosis is a cell death process which plays an important role in the development of multi-cellular organisms and in the regulation and maintenance of cell populations in tissues under physiological conditions. Use of reporter probes for monitoring cell differentiation and programmed cell death proved to be feasible in animal models.

The aim is to establish a technique that will enable to capture intra-cellular protein interactions known to occur during apoptosis.

Pre-clinical validation in major disease areas

Since specific problems sometimes require specific solutions, researchers have been focusing on the development of tailored imaging tools and techniques within some specific major disease areas of cell therapy applications: neurological disease (stroke); cardiovascular disease (myocardial infarction), musculoskeletal disease, diabetes and cancer.

In order to develop these pioneering tools, three SME's and a huge number of research institutes are involved in the realisation of the aims within this multifaceted research field, with organisations being based in the United Kingdom, Israel, Germany, Italy, the Netherlands, Spain, the Czech Republic and France.

Basic and translational research on the immunotherapy of cancer were fostered

To increase the efficacy of cancer immunotherapy, basic scientists and clinicians work together to create better tools for understanding how a tumour avoids elimination and how these "escape mechanisms" can be combated therapeutically. In vitro and mouse models of cancer, used by the project partner Radboud University Nijmegen (RUNMC), serve to monitor how cytotoxic lymphocytes migrate into and kill tumours (Fig.1a) and help to identify soluble factors released by the tumour which impair immune-cell functioning. These factors are then antagonised in immunocompetent mouse models of cancer to test their suitability for therapy in patients. Immunotherapy of cancer uses ex vivo generated and activated immunocompetent cells of cancer patients, which after injection assist the immune system in eliminating the tumour. Despite strong progress in generating potent immune cells in the laboratory, once applied in patients their efficiency in the tumour itself is often not sufficient.

Beyond in vitro models, the experts monitor the migration and anti-tumour function of immune cells in patients during therapy. One focus is on specialised antigen presenting cells (dendritic cells (DC)), which are generated from patients´ monocytes by a standardised in vitro culture method and then loaded with melanoma specific tumour antigens. In ethically approved phase I-II trials melanoma patients with advanced disease repeatedly receive their DC as "tumour vaccines". After therapeutic application, DC migrate to various lymphoid organs (Fig.1b) and instruct cytotoxic immune cells to spot and combat the melanoma antigen. If successful, cytotoxic T-cells and other immune effector cells are activated by the DC, invade the metastases and destroy the tumour cells (Fig.1a).

With this vision ENCITE pays tribute to the hope of clinicians that one day tumour vaccines will prevent metastases in high-risk tumour patients.

Results, references and publications:
www.encite.org

Training workshops in the spotlight

The efficient introduction of newly developed tools, technologies and procedures within ENCITE in the medical sector cannot be achieved without having skilled and trained personnel. Therefore, the consortium has been elaborating a training programme for 2011 and 2012 on the use and implementation of the generic tools and methodologies as well as specialised workshops on the various disease-specific areas.

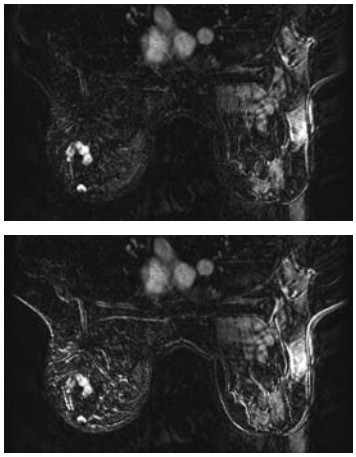
A special highlight will be the ENCITE Scientific Symposium entitled 'Imaging Cellular Decisions', held at the Weizmann Institute of Science, Rehovot/Israel, on 27 March 2011, 09:00 – 16:00.

This one-day symposium will expose the European and Israeli research community to the latest advanced technologies that provide temporal and spatial information on cell fate from the living organism. This event is open to anyone interested, please feel welcome to attend!

Make sure to keep up with the forthcoming educational courses and seminars, lectures and workshops to gain knowledge of cutting edge technologies, share experiences and become skilled at newly developed ENCITE methodologies.

Dates, topics and information for registration are available at: www.encite.org > news, or send an email to: office@eibir.org

HAMAM — digital fight against breast cancer



Breast-MR image (maximum-intensity projection) before and after motion correction.
© Fraunhofer MEVIS, Bremen/DE

In September 2010, the final year of the project HAMAM – Highly Accurate Breast Cancer Diagnosis Through Integration of Biological Knowledge, Novel Imaging Modalities and Modelling began.

The second project year was extremely successful and showed considerable progress towards the final goal: to develop tools for the improvement of both the sensitivity and specificity of breast cancer detection and diagnosis.

The HAMAM project has so far conducted two years of research dedicated to improved computer support for the detection and diagnosis of breast cancer in multi-modal images. The first project year was centred on a thorough understanding of the clinical workflow in the multi-modal environment. The established clinical goals and scientific objectives had to be transported into software requirements and algorithmic goals, and a concept and first implementation of the workstation was provided.

The second project year showed visible progress both scientifically as well as regarding the integration of those scientific achievements into the workstation prototype. The HAMAM Clinical Advisory Board, composed of leading radiologists in this field, defined use case scenarios that apply to multiple modalities (MG, MRI, etc.) and/or multiple scenarios (e.g. high-risk screening, follow-up examination, etc.). The consortium collaborated closely so that a workstation is available that already shows many of the advanced concepts that are expected as a final result, and that reflects the use cases identified by the clinical advisors in the first project year.

Clinical requirements and use cases

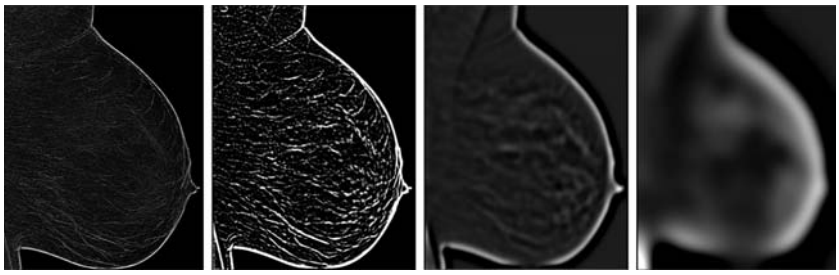
Implementation of these elementary use case elements into the workstation is reflected by the availability of integrated viewing capabilities for the considered modalities Tomosynthesis, 3-D breast ultrasound 3DBUS, Positron Emission Mammography (PEM), dynamic contrast-enhanced magnetic resonance imaging (DCE-MR)I and Mammography (MG). Also, a patient overview and a quick-access time line now extend the conventional tabular patient browser and display clinically relevant information about e.g. breast density and known genetic predispositions such as BRCA gene alterations at the first glimpse.

To aid the radiologist with multi-series intra-modality and cross-modality reading, support was added to make use of automatic registration results. For this purpose, the project invented and implemented the generic concept of a fuzzy cursor: from the exact position in one series, an approximate location in another modality or series is calculated and visualised within a fuzzy region. Many of the algorithms that were developed in the second project year fed into this concept, including registration, but also specific pre-processing methods that detect landmarks in different modalities, for example pectoral muscles, nipple, and breast outline in mammography, MRI, and 3D BUS, registration for temporal comparison in mammography and MRI, etc. Model-based image analysis has also been improved, in particular regarding dynamic contrast-enhanced MRI. The visualisation of kinetic parameters using colour maps is what the radiologists expect. To obtain more robust estimates of these parameters, pre-processing of dynamic time series was mandatory. Another hot achievement aims to help mammographers to compare mammography pairs that have been processed differently, yielding different contrast characteristics. A method was developed and implemented that measures these differences and minimises them.

Prof. Gabor Szekely

'The EIBIR network is a very important asset, allowing the full integration of our efforts into the European imaging community. In addition, the Biomedical Imaging Platform of EIBIR offers an integrative frame for continuous discussions and exchange with our colleagues throughout Europe. Finally, EIBIR is instrumental in the preparation and execution of supranational research projects, e.g. within the frames of the 7th Framework of the EC.'

— Prof. Gabor Szekely, Swiss Federal Institute of Technology, Zürich/CH
EIBIR active Network Member



Mammography different scales: four different frequency images of the original

Scientific achievements

Many scientific achievements have been connected to these visible results. MRI bias field correction helps to alleviate systematic brightness patterns resulting from the MRI coils that reduce the quality of kinetic parameter accuracy. MRI adipose/glandular tissue segmentation is a prerequisite for the mapping of MRI volumes to mammography, and additionally it will help to calculate volumetric breast density from MRI. Other tools to segment structures from MRI provide useful boundary conditions for registration algorithms as well as for measurements of lesion positions.

Regarding registration, further investigations into motion correction of time series were conducted to provide more robust pharmacokinetic modelling. Different MRI contrasts can be co-registered to allow more precise multispectral analyses. Breast deformations can furthermore be modelled with finite element methods, where several research activities were carried out to determine tissue parameters and model parameterisation. A fast implementation on the GPU (graphical processing unit) makes this class of algorithms capable of near real-time performance, e.g. to simulate deformations of the breast when it is compressed in mammography or tomography systems. The insights gained from this work will also help to understand deformations that occur in 3D BUS, and might contribute to the development of registration methods between 3D BUS and other modalities.

Today, no computer-aided detection systems for breast MR exist or operate at a level that is sufficient for clinical application. In this second project year the HAMAM consortium expanded and improved the previously developed MR feature extraction methods. This led to better performance of mass lesion detection.

One of the most ambitious project goals is the derivation of new tumour markers from the multi-modal data. Efforts have been made to derive new knowledge from the data collected so far. Of particular success was a preliminary study of the estimation of the individual 10-year risk of breast cancer using the patient's genetic profile combined with her family history. The results indicated a decisive influence of genetic information. The study was internationally published and might potentially impact individual patient management by incorporating genetic testing information. Also, comparison of classifiers employed in CAD servers with a focus on reproducibility and robustness was conducted. A stable classification strategy with respect to feature selection has been identified, which will help to determine the added value of different modalities in the subsequent multi-modal studies.

Expected final results and their potential impact and use

The project set out to help to detect more harmful forms of breast cancer at an earlier stage. The HAMAM consortium aims to contribute to a reduction of breast-cancer-induced mortality by providing means for a more reliable diagnosis and better justified treatment decisions. Thus, the final results of the project comprise

— improved scientific knowledge regarding the formation and genetics of breast cancer and their appearance in various imaging modalities, both conventional (MG, MRI) and novel (Tomosynthesis, PEM) and

— a workstation that incorporates advanced image presentation and analysis methods.

During the clinical evaluation which will be conducted in 2011 the workstation will show how the scientific results and algorithmic achievements of the project contribute to the project objective. It will incorporate tools for easy per-modality lesion detection (CADe) and cross-modality correspondence establishment, automated cross-modality lesion feature calculation and diagnostic aid with a multi-modality assessment of imaging findings (CADx).

In 2010, HAMAM was invited to show its results at various scientific conferences and exhibitions, including the ICT 2010 – organised by the European Commission and a gathering point for researchers, business people, investors, and high-level policy makers in the field of digital innovation. As co-ordinating institution, we are very proud that HAMAM is considered a European star project in the area of eHealth: http://ec.europa.eu/research/star/

Please visit: www.hamam-project.org

PEDDOSE.NET — investigating radiation doses

In April 2010, the European project PEDDOSE.NET started its work in full swing. The full title of the project is "Dosimetry and Health Effects of Diagnostic Applications of Radiopharmaceuticals With Particular Emphasis on the Use in Children and Adolescents", and the project sets out to evaluating the potential health impacts of diagnostic imaging agent doses.

Nuclear medicine significantly contributes to the health, healthcare and quality of life of European citizens, particularly in major clinical areas such as cancer and cardiovascular disease. Every year over 6 million patients benefit from a nuclear medicine procedure in Europe, 95% of which are diagnostic and 5% therapeutic. The evaluation of the impact of small and non-repetitive or less repetitive doses of radioactive substances on patients' health, as currently used in diagnostic imaging procedures, has up to now not been addressed systematically in a European context. This is where the PEDDOSE.NET project steps in.

At the Kick-Off Meeting in Vienna/AT, the project consortium availed itself of the opportunity to discuss the respective steps to reach the final goal, namely to provide data on dosimetry and corresponding dose-related risks when administering radiopharmaceuticals for diagnostic purposes. The results shall focus on assessing how absorbed doses were derived and how new developments within that field can improve the level of confidence associated with dosimetric findings.

The key work of the project is carried out within different work packages, which represent the relevant expertise of the participating groups.

The consortium of PEDDOSE.NET is headed by Prof. Michael Lassmann from the University Clinic of Würzburg and consists of leading experts in Europe dealing with dosimetry of nuclear medicine. The results of the project will bring about improved patient radiation protection, further enhancement of the number of nuclear medicine procedures and an immense increase in knowledge within the European Union.

More information is available at: www.peddose.net

Fig.1: PET Scanner

Prof. Michael Lassmann

'A rigorous evaluation of health effects caused by diagnostic radiopharmaceuticals requires the knowledge of the underlying scientific data. This is a challenge as, for many substances, some of these data have been published many years ago, applying the methodologies available at that time.

In addition, new hybrid imaging devices are available, which require new and adapted protocols. Therefore, for the first time in Europe, PEDDOSE.NET, a consortium of five European partners, under the professional management of EIBIR, carries out a systematic scientific evaluation of the available data on radiopharmaceuticals with particular emphasis on paediatric nuclear medicine. The aim is to provide recommendations on a patient-specific dosage when applying radiopharmaceuticals for diagnostic purposes.'

— Prof. Michael Lassmann, PEDDOSE.NET Scientific Co-ordinator, Würzburg/DE

Euro-BioImaging — European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences

Euro-BioImaging is one of ten Biological and Medical Sciences (BMS) Projects included in the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI). The project is scientifically co-ordinated by EIBIR (Medical Imaging) and the European Molecular Biology Laboratory, EMBL (Biological Imaging), and aims to establish a pan-European Research Infrastructure for biomedical imaging in a co-ordinated and harmonised manner.

Euro-BioImaging will meet the imaging requirements of both biological and medical imaging communities by creating infrastructure facilities ('nodes') in many European countries under one umbrella and therefore significantly addresses the fragmentation of such efforts currently present in Europe.

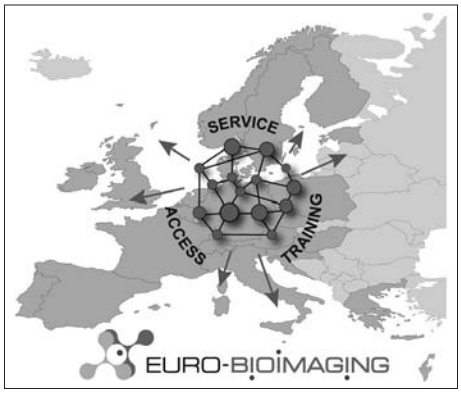


Fig.1: Euro-BioImaging Research Infrastructure

The overall aims of Euro-BioImaging are

- bringing together key research areas in biomedical imaging stretching from basic Biological Imaging and Molecular Imaging to the clinical and epidemiological level of Medical Imaging
- creating a co-ordinated and harmonised plan for imaging infrastructure deployment in Europe
- providing access to state-of-the-art imaging technologies, training and a continuous development of imaging research technologies to offer them as a service.

Via the combination of technological and strategic objectives, Euro-BioImaging will provide key elements of successful infrastructures: supporting pan-European research, training and innovation in biomedical imaging (Fig.1).

In April 2010, EIBIR appointed Prof. Stefan Schönberg (University Medical Centre Mannheim) as one of the two Scientific Co-ordinators of Euro-BioImaging. In this function Prof. Stefan Schönberg succeeds Prof. Gabriel Krestin and takes responsibility for reaching the project goals of the medical imaging community.

2010: The project takes shape

Under the lead of EIBIR and EMBL, a consortium of 39 partners from 23 countries elaborated the proposal for the 3-year Preparatory Phase of Euro-BioImaging. The proposal was submitted under the EC FP7 Call INFRA-2010-2.2.7 in December 2009. EIBIR is happy and proud to announce that the Euro-BioImaging proposal was rated on top of all ESFRI infrastructure projects applying for Preparatory Phase funding.

The official start of the Preparatory Phase, which will be funded with €5.2m from the European Commission, was in December 2010.

The Preparatory Phase of Euro-BioImaging aims at elaborating a plan to construct and operate a set of complementary and highly interconnected imaging infrastructure facilities based on the comprehensive assessment user needs regarding their requirements for service, access and training. Furthermore, the legal, governmental and financial framework for the research infrastructure will be developed and the commitment of future partners (funding bodies) will be assured. Thirteen strongly interlinked Preparatory Phase work packages will closely collaborate to meet the ambitious goals of the project (Fig. 2).

Five core technology work packages will cover imaging technologies ranging from general advanced light microscopy, innovative ALM technologies, via molecular imaging up to innovative medical imaging technologies and patient and population imaging. They will focus on the survey of user requirements, conduct proof-of-concept studies and finally elaborate a construction plan for the respective imaging infrastructure.

Common to all Euro-BioImaging facilities, irrespective of their specific technology, is the necessity to prepare a draft for user access to and training in the imaging technologies they intend to offer. In addition, by users' application of any of those technologies in their research, this generates large amounts of digital image data, which creates a common need for data management, processing, and storage tools. These overarching technical objectives will be addressed by the three work packages User Access, Training and Data Storage and Analysis. Furthermore, as a pan-European infrastructure project Euro-BioImaging will have to define the legal and governance framework under which it will be constructed and operated. Similarly crucial is the development of a finance plan in close co-operation with the national funding bodies to provide the monetary basis required for construction and operation. Based on both the legal framework and the finance plan, the key objective of the Preparatory Phase is to draft an overarching business concept that provides a realistic basis for the infrastructure design. These objectives will be met by the three strategic work packages Legal, Governance & Ethical Issues, Process Plan and Finance Planning.

In addition to its 39 core partners (beneficiaries) the Euro-BioImaging consortium comprises more than 80 associate partner institutions. Euro-BioImaging also received more than 180 "Letters of Intent" from universities, research councils, ministries, funding organisations and the industry.

The great interest in this research – infrastructure even before the official project start – as well as the inclusion in 11 national roadmaps clearly indicates the pan-European support for the vision of Euro-BioImaging.

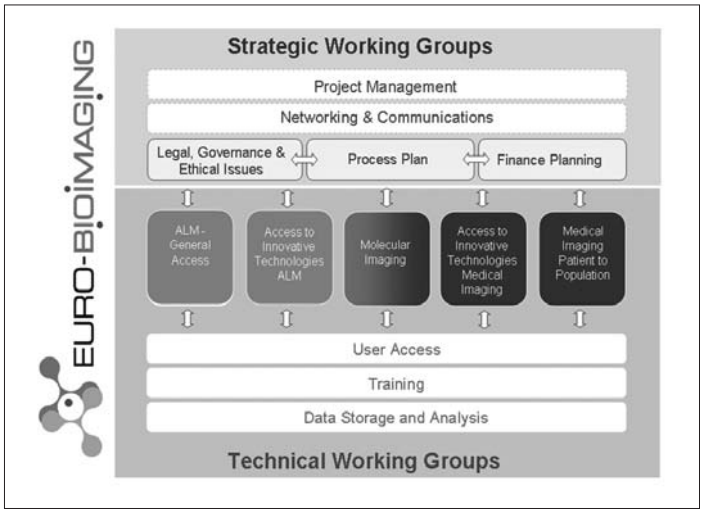


Fig.2: Interrelations and Work Flow of the Euro-BioImaging Work Packages

Euro-BioImaging in the context of BMS Research Infrastructures

Euro-BioImaging seamlessly fits into the European and global Research Infrastructure landscape and will closely collaborate with other ESFRI Research Infrastructures in the Biomedical Sciences as well as e-Infrastructures. Given their cross-cutting nature, Euro-BioImaging intends to provide expertise in and access to innovative imaging technologies for virtually all BMS Research Infrastructures.

In 2010 the ten BMS projects made a common effort to emphasise that a successful implementation and operation of the BMS Research Infrastructures is in Europe's utmost interest. In this regard a "BMS Strategy Paper" was prepared. Its content and objectives were presented to EU policy audiences (MEPs, EC Officials, Permanent Representations of Member States) during an official launch event on 25 October 2010 in Brussels.

Getting involved: Stakeholders and Associated Partners

To ensure the comprehensive and early consultation and engagement process and to build a community of stakeholders in the field of biomedical imaging Euro-BioImaging will conduct annual Stakeholder Meetings.

EIBIR hosted the 2nd Euro-BioImaging Stakeholder Meeting on 21/22 October 2010 in Vienna. 250 European and non-European stakeholders joined this event and seized the opportunity for interactive communication and exchange of ideas in ten work-package-related breakout sessions. A preceding "Industry Meeting" had been organised with leading vendors and producers of biomedical imaging equipment in Europe forming the basis for the establishment of the Euro-BioImaging Industry Board. The next Stakeholder Meeting is envisaged for early 2012.

Additionally, an internal section (WIKI) of the Euro-BioImaging website (www.eurobioimaging.eu) was established, which will serve as the central communication platform for all associated partners of Euro-BioImaging and enable the permanent exchange of information.

Steps towards implementation

The planning and construction of future Euro-BioImaging nodes will be an open and transparent process aligned with the different phases of the Euro-BioImaging project:

Consultation phase 2011—2012

In a close consultation process with all Euro-BioImaging partners, future users, potential funders and other stakeholders, Euro-BioImaging will develop and publish eligibility criteria for nodes of the planned infrastructure. Common criteria for all Euro-BioImaging nodes will comprise scientific/technological excellence, open access for external users and support from funders. More detailed criteria, regarding access rules and training as well as criteria specific to different imaging technologies will be developed. The process for an open call for nodes and evaluation of node applications will be elaborated in detail, and an independent evaluation panel will be established.

Planning phase 2012—2014

Based on the defined eligibility criteria, Euro-BioImaging will publish an open call for future nodes. Facilities and institutions that fulfil these criteria, including demonstrated interest/support from funders, can apply for this call.

The independent evaluation panel will select and recommend Euro-BioImaging nodes for construction.

Construction phase 2014—2017

Based on the recommendations of the evaluation panel and financial commitment of the funders, the Euro-BioImaging nodes will be newly constructed or existing facilities will undergo major upgrades.

Please visit: www.eurobioimaging.eu

Prof. Stefan Schönberg

'My motivation is that every member of the EIBIR community interested in research will have access to the harmonized biomedical imaging research infrastructure of Euro-BioImaging and thus can better participate in the pan-European process of innovation in biological and biomedical imaging. This will help individual institutions to sharpen their profile in their specific area of research expertise and thus become more competitive on a national and international level.

Given the start of the preparatory phase of Euro-BioImaging this month, I would like to stimulate the membership to approach the EIBIR project management in order to learn about the many ways of how to get actively involved in this exciting European initiative.'

— Prof. Stefan Schönberg, Scientific Co-ordinator medical imaging, Mannheim/DE

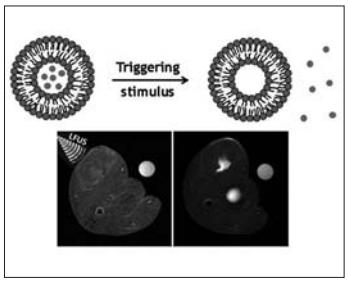
What's new?

Green light for new COST Action on theranostics imaging and therapy

COST is an intergovernmental framework for European Co-operation in Science and Technology, allowing the co-ordination of nationally funded research on a European level. COST contributes to reducing the fragmentation in European research investments and opening the European Research Area to co-operation worldwide.

In July 2010, EIBIR submitted the full proposal of the COST Action on 'Theranostics imaging and therapy: an Action to develop novel nanosized systems for imaging-guided drug delivery.' After the submission, a strict evaluation process followed before the selection of new accepted Actions was made by the COST Office.

EIBIR is very proud to have received acceptance of its first Action in December 2010. The main objective of the Action is to exploit nanotechnology advances in pharmaceutical and biomedical imaging fields to develop innovative image-guided therapies for the cure of diseases with a high social impact.



Under the leadership of Prof. Silvio Aime from the University of Torino, Italy, the Action will be implemented within a period of four years and with a team of approx. 50 experts from Austria, Belgium, Germany, France, Italy, the Netherlands, Portugal and the United Kingdom.

The Action brings together major European research groups working on the development of novel combined diagnostic/therapeutic agents (theranostic agents). Properly designed agents will allow the in vivo quantitative assessment of the amount of drug reaching a pathological region and the visualisation of molecular changes due to the therapeutic effects of the delivered drug.

Researchers will join efforts to develop novel therapeutic treatments based on the visualisation of drug delivery/release processes and the monitoring of associated therapeutic effects.

The Action goals will be reached thanks to a strong interdisciplinary co-ordination work mostly focused on getting a better understanding of crucial aspects of the whole in vivo drug delivery process, in particular regarding the efficiency of drug targeting and release and its connection with the therapeutic effect.

As this field is expected to be an essential component in practical medicine of the forthcoming years, it seems sound to interact with research teams that, although not directly involved in the development of theranostic procedures, can contribute to specific topics with competence.

An IMI project on quantitative imaging biomarkers in cancer

EIBIR's Cancer Working Group has been actively involved in the preparation of a submission in the context of the Innovative Medicines Initiative. The project "Quantitative Imaging in Cancer: Connecting Cellular Processes with Therapy; QuIC-ConCePT" brings industrial and academic partners together in order to develop and validate quantitative imaging biomarkers.

The proposal is co-ordinated by AstraZeneca and managed by the European Organisation for Research and Treatment of Cancer (EORTC). A significant objective of the proposal is qualifying three specific imaging biomarkers of tumour cell proliferation, apoptosis, and necrosis, which will allow the drug developer to reliably demonstrate the modulation of these pathologic processes in tumours within patients in future trials. The aim is for these biomarkers to be incorporated into decision-making in Phase I trials of investigational therapies at the end of the project.

Research results are supposed to prove biomarkers' validity and show that measured alterations within the biomarker faithfully reflect the desired change in the underlying tumour pathology. The newly developed quantitative imaging biomarkers are then intended to be readily deployed in multiple cancer centres in a robust, consistent, ethical, and cost-effective way which, at the same time, will be acceptable to the patients volunteering for our trials. A second objective is to elaborate a portfolio of highly innovative, creative and cutting-edge approaches to devise, evaluate and introduce quantitative imaging biomarkers of invasion and metastasis.

In order to achieve the goals strived for, within the project platforms for data acquisition, analysis and dissemination will be standardised and integrated across the consortium. This standardisation will be essential for the successful implementation of the newly evolved quantitative imaging biomarkers, with these having a large potential to markedly improve drug development and benefit cancer patients both in Europe and globally.

Events in the spotlight

EIBIR is pleased to announce a wide variety of public events, sessions and educational courses to present the latest EIBIR activities and update the interested audience on the progress of its projects.

You are most welcome to attend these events!

Keep up with the news and updates on our websites, and for any further information please don't hesitate to send an email to: office@eibir.org

www.eibir.org
www.encite.org
www.hamam-project.org
www.eurobioimaging.eu
www.peddose.net

PEDDOSE.NET Session at ECR 2011
Multimodality Imaging: Do we apply too much radiation?

Date: 4 March 2011, 10:30–12:00

Venue: ECR 2011, Austria Center Vienna/AT, Room Z

PEDDOSE.NET, the nuclear medicine project co-ordinated by EIBIR, presents its first results at the European Congress of Radiology in Vienna (ECR 2011).

Moderator: M. Lassmann, Universitätsklinikum Würzburg/DE

Radiation Exposure in Nuclear Medicine for Children and Adults
U. Eberlein, Universitätsklinikum Würzburg/DE

CT-Protocols and Radiation Exposure in multimodality imaging
C. Vandervoorde, Gent University/BE

Strategies for optimising patient radiation protection in multimodality imaging
a) Nuclear Medicine
M. Lassmann, Universitätsklinikum Würzburg/DE
b) CT
K. Bacher, Gent University/BE

EIBIR presents: IMAGINE Workshop at ECR 2011

Date: Friday, 4 March — Sunday, 6 March 2011

Venue: ECR 2011, Austria Center Vienna/AT, Lounge 4

EIBIR presents this year's IMAGINE Workshop, a new concept for ECR visitors. Instead of showing already available products, the IMAGINE Workshop will give researchers the opportunity to show their developments which are not yet on the market, with the focus being set on four topics,
(1) Cardiovascular image analysis,
(2) Neuro-image analysis,
(3) Image analysis in oncology, and
(4) Image-guided intervention.

EIBIR Network Member Session at ECR 2011
Euro-BioImaging takes shape

Date: 5 March 2011, 16:00–17:30

Venue: ECR 2011, Austria Center Vienna/AT, Room Z

In order to present Euro-BioImaging and to define a clear pathway for the involvement of the medical imaging community, general and specific aspects of the project will be presented by the Scientific Co-ordinator and three work package leaders. Talks will particularly address work package related topics, but also indicate how the respective imaging community is represented in Euro-BioImaging.

Moderator: S. Schönberg, University Medical Center Mannheim/DE

EIBIR news
J. Hennig, Freiburg/DE

Overview Euro-BioImaging
S. Schönberg, Mannheim/DE

Health Technology Assessment
L. Donoso, Barcelona/ES

Access to Innovative Technologies in Medical Imaging
J. Hennig, Freiburg/DE

DK Emerging Technologies in Medical Imaging: From Patient to Population
J. Frokiaer, Aarhus/DK

Discussion and Reception

ENCITE Session at ECR 2011
Visualisation of cell therapy meets clinical application

Date: Sunday, 6 March 2011, 08:30–10:00

Venue: ECR 2011, Austria Center Vienna/AT, Room Z

Meet ENCITE experts at ECR 2011! Cutting-edge developments of novel cell therapies pointing to clinical applications will be presented at the European Congress of Radiology (ECR). Novel imaging tools are an absolute prerequisite for patients' understanding of therapeutic effects. Three examples of visualisation show promising results.

Moderator: G. Krestin, Erasmus, Rotterdam/NL

08:30–08:50
ENCITE – A translational approach to novel cell therapy applications
S. Aime, Torino/IT

08:50–09:10
Visualising transplanted neural stem cells and tissue regeneration by MRI
M. Modo, London/UK

09:10–09:30
Imaging dendritic cell vaccinations in melanoma patients
M. Srinivas, Nijmegen/NL

09:30–09:50
Monitoring of transplanted pancreatic islets in humans by MRI
M. Hajek, Prague/CZ

09:50–10:00
Discussion and exchange

You are most welcome to attend the reception at 12:00 for personal discussions (same place, after the EuroAIM Session)!

EuroAIM Session at ECR 2011
Why is evidence-based radiology crucial?

Date: Sunday, 6 March 2011, 10:30–12:00

Venue: ECR 2011, Austria Center Vienna/AT Room Z

EIBIR has initiated a European Working Group on Evidence-Based Radiology (EBR) to strongly assess radiological technology and the evidence for its best use in clinical practice. The working group will answer the following questions: What radiological topics are covered by systematic reviews and meta-analyses and what topics are uncovered?

Moderators: G. Krestin, Erasmus, Rotterdam/NL
F. Sardanelli, University of Milan/IT

10:30–10:50
Applying EBM to radiology – The EuroAIM project
F. Sardanelli, Milan/IT

10:50–11:10
Secondary evidence for diagnostic imaging
L. M. Sconfienza, Milan/IT

11:10–11:30
Secondary evidence for interventional radiology
D. Vorwerk, Ingolstadt/DE

11:30–11:50
The ACRIN experience
B. J. Hillman, Charlottesville/USA

11:50–12:00
Discussion

12:00
Reception

ENCITE Scientific Symposium in Israel
Imaging Cellular Decisions

Date: 27 March 2011, 09:00–16:00

Venue: Weizmann Institute of Science, Rehovot/IL

This one-day symposium will expose the interested research community within Europe and Israel to the latest advanced technologies that provide temporal and spatial information on cell fate from the living organism. (www.encite.org)

ENCITE workshop 'Introduction and Hands-on Training on 4D Optical Imaging'

Date: 18 or 19 June 2011 (tbc)

Venue: EMIM 2011, Leiden/NL

This half-day workshop organised by the ENCITE project partner BioSpace Lab/FR will comprise two groups, with one working directly with the machine and animals while the other one attends a presentation and then vice versa.

ENCITE Scientific Session and Educational Session at EMIM 2011

Date: 19—21 June 2011

Venue: EMIM 2011, Leiden/NL

ENCITE experts meet the imaging community at the European Molecular Imaging Meeting (EMIM) 2011. The congress brings together top European scientists from various disciplines working in diverse fields of molecular imaging to discuss latest research discoveries and possible translations into medical practice. The ENCITE Session and Educational Course will be hosted by the Leiden University Medical Center, one of the ENCITE project partners.

The ENCITE Scientific Session will focus on in vivo cell tracking as a global theme.

The ENCITE Educational Session will cover the following topics: optical imaging, MRI and generation of imaging reporter constructs (19 June 2011, 08:30 – 10:00).

ENCITE Educational Course on Molecular MRI in Experimental Neuroscience

Date: 30 June — 2 July 2011

Venue: Max-Planck-Institute, Cologne/DE

ENCITE is pleased to offer this course within the "Lectures on MR" programme of the European Society for Magnetic Resonance in Medicine and Biology (ESMRMB). Both partners Max-Planck-Institute/DE and University of Basel/CH are in charge of the scientific programme.

EIBIR Summer School on Biomedical Image Analysis

Date: 21—26 August 2011

Venue: Dubrovnik/HR

After the success of the EIBIR Winter School in 2010 (Viladrau/ES), the next course will take place in August 2011 in Dubrovnik. This time the focus will be on neuro-imaging. A particular ENCITE Lecture will be held during the school. Details: www.eibir.org/school

ENCITE Mini-categorical Course on Molecular Imaging at ESMRMB 2011

Date: 6—8 October 2011, 08:00–09:00

Venue: Leipzig/DE

Meet ENCITE experts at ESMRMB 2011!
New tools, MR contrast agents and sequences as well as in vivo / in vitro spectroscopy work and cell tracking in a pre-clinical setting will be presented. Experts from the Netherlands, the United Kingdom, Germany and Belgium will present new tools for optical imaging, MR contrast agents and MR sequences as well as news on in vitro and in vivo spectroscopy, etc.

Moderators: V. Herynek, Prague/CZ
F. Gazeau, Paris/FR

6 October

Talk 1: New tools for whole-body optical imaging
C. Lowik, Leiden/NL

Talk 2: MR contrast agents for molecular imaging
K. Brindle, Cambridge/UK

7 October

Talk 1: MR sequences for negative and positive contrast measurements
C. Faber, Münster/DE

Talk 2: Detection of stem cells and biomaterials. In vitro and in vivo spectroscopy work of stem cells
M. Modo, London/UK

8 October

Talk 1: In vivo MRS in rodent models
U. Himmelreich/BE

Talk 2: Cell tracking in a pre-clinical setting
M. Bernsen, Rotterdam/NL

ENCITE Workshop on Molecular Imaging in Skeletal Tissue Regeneration

Date: 25—27 October 2011

Venue: Tel Aviv University/IL

Students and scientists involved in biomedical imaging, tissue regeneration and stem cell therapies with focus on skeletal disorders are welcome. Both ENCITE partners, the Tel Aviv University and the Hebrew University of Jerusalem, are pleased to organise this workshop.

ENCITE Workshop on New Tools and Applications in Optical Imaging and its Translation Into the Clinic

Date: End of October / Beginning of November 2011

Venue: Leiden University Medical Center/NL

The workshop will deal with the latest developments in cellular and whole-body optical and opto-acoustic technology, targeted nanoparticles and smart activatable probes, etc. to follow cell migration, differentiation, cell death and other important molecular processes.

ENCITE Session on Imaging and CARS

Date: 25—29 January 2012

Venue: Winter PhD School on NMR and MRI, Venetian Institute for Science and Arts, Venice/IT

The school will be organised by the University of Milano-Bicocca, project partner of ENCITE, in collaboration with the Italian Biophysics Society. As part of the school, an ENCITE Session will be held with respect to chemiluminescence, fluorescence imaging, non-linear optical imaging and CARS (Coherent Antistocks Raman Imaging). The workshop addresses PhD students, Postdocs and young researchers.

Imprint EIBIR Annual Scientific Report 2010

Editorial Board
Prof. Jürgen Hennig
Prof. Gabriel Krestin

Managing Editors
Eva Haas
Monika Hierath

Contributing Writers
Sonja Guttenbrunner
Pamela Zolda
Petra Baumgartner

Contact
EIBIR Office
Neutorgasse 9/2a
1010 Vienna, Austria

Phone: +43 1 533 40 64-29
Fax: +43 1 535 70 41
E-mail: office@eibir.org
www.eibir.org

Founded by:

European Society of Radiology

Date of printing: January 2011
Printed by: Typo Druck Sares
Design & Layout: www.nikolausschmidt.com