EIBIR ANNUAL SCIENTIFIC REPORT 2008

EUROPEAN INSTITUTE
FOR BIOMEDICAL
IMAGING RESEARCH

CONTENTS

Dear Members, Dear Colleagues, Dear Partners,

Another successful year for the European Institute for Biomedical Imaging Research (EIBIR) has drawn to a close and we are pleased to present you with an update and review of last year's activities and research projects, as well as detailed information on planned activities.

During the past year, EIBIR's membership has grown to close to 240 research institutes with a focus on biomedical imaging or related disciplines. This number shows that networking activities in our specialty are crucial and that EIBIR is on the right track towards establishing itself as a bridge between basic and clinical research, technological and pharmacological development. Our goals of creating multi and inter-disciplinary research environments, bringing together medical doctors, physicists, mathematicians, molecular biologists and computer scientists, achieving close co-operation between universities and major research centres as well as increasing collaboration between imaging specialists and clinicians, are no doubt ambitious and require collaboration with pharmaceutical industry, system manufacturers, and information technology.

Of course many of our new initiatives would not have been possible without the continuous support of the European Society of Radiology and our industry partners, who subscribed to the mission of EIBIR and have provided financial support right from the beginning. We very much regret that one of our long-standing supporters, Bayer Schering Pharma AG, has withdrawn as an Industry Panel member and look forward to welcoming new industry members in the near future. Reduced annual support fees should also enable smaller companies with an interest in the biomedical imaging field to become involved in our network.

During 2008 we were pleased to officially welcome two new organisations as co-shareholders of EIBIR - the European Association of Nuclear Medicine (EANM) and the European Federation of Organisations of Medical Physicists (EFOMP) - and negotiations are also underway with the European Organisation for Research and Treatment of Cancer (EORTC) and the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB). Co-shareholders are represented at the general meetings of EIBIR, where major strategic decisions are taken and recommendations are developed for the other bodies and initiatives of EIBIR.

As there are some European organisations that are eager to support and seek cooperation with EIBIR but are unable to commit to formal co-shareholdership, mainly due to their charity status, we are planning to introduce an additional, less formal form of cooperation with such organisations under the umbrella of 'Friends of EIBIR'. This concept is currently being developed and will be launched in early 2009.

EIBIR's four joint initiatives, all developed during 2007, have further expanded their activities. The Chemistry Platform has set up a consortium of Europe's leading experts in developing smart agent probes to prepare a project proposal for the EU FP7 health call launched in early September.

EuroAIM, the European Network for the Assessment of Imaging in Medicine, has worked on collecting data on assessment studies carried out by EIBIR member institutions in order to help investigators find each other and facilitate collaborative efforts and multicentre studies. In addition, an online survey on pharmaceutical trials was launched in December.

2008 has seen the onset of two major research projects co-funded by the European Union under the coordination of EIBIR. ENCITE, the European Network for Cell Imaging and Tracking Expertise, is a large-scale collaborative project that aims at developing novel imaging tools that will lead to a better understanding of how cell therapy works, the possibility of response monitoring in patients and sufficient safety of the treatment.

The other project, HAMAM - Highly Accurate Breast Cancer Diagnosis through Integration of Biological Knowledge, Novel Imaging Modalities, and Modelling - has the potential to strengthen Europe's leadership in the area of image-based breast cancer diagnosis. Together with two consortia of Europe's top experts in the relevant fields, EIBIR submitted two new proposals within the EU FP7 programme HEALTH call in early December.

One project deals with the development of smart agents that provide maps of values of physico-chemical parameters such as pH and pO2 or of specific enzymatic activities. The obtained maps will be fused with anatomical images to provide completely new information content that has until now not been accessible via imaging methods. The second project focuses on nuclear medicine and consists of a literature survey on dosimetry and health effects of diagnostic applications of radiopharmaceuticals.

You will find a detailed update on the projects in this report.

Last, but not least, and although still semi-official, it is our pleasure to inform you about yet another ambitious project that is currently in the pipeline and that has received positive feedback by the panel of evaluators: EIBIR and the European Molecular Biology Laboratory (EMBL) have submitted a proposal to the European Strategy Forum on Research Infrastructures (ESFRI) on establishing a European biomedical imaging infrastructure - from molecule to patient. The project was presented at an ESFRI conference in Versailles in December 2008.

Don't forget to check EIBIR's website, which is currently undergoing a facelift, for regular updates on EIBIR's developments and initiatives.

We look forward to your active contribution to EIBIR's activities and to receiving your ideas for new initiatives and projects.

Yours sincerely,

Prof. Gabriel Krestin
ESR Representative at the
EIBIR General Meeting
ESR Research Committee Chairman

Prof. Jürgen Hennig
EIBIR Scientific Director

THE EIBIR COMMUNITY IS GROWING

EIBIR is continuously gaining importance and popularity among European and international research institutes active in the field of biomedical imaging research. We have already attracted close to 240 institutions from 30 countries, with the top three countries currently being Germany, the United Kingdom and France.

In 2008 alone we gained 35 new members from all over Europe (Belgium, Denmark, Finland, France, Germany, Israel, the Netherlands, Romania, Slovenia, Spain, Switzerland, Turkey, the United Kingdom) and India.

EIBIR membership is currently FREE OF CHARGE and has many advantages:

— The possibility to contact other European research institutions with similar expertise to exchange experiences or ideas

— Access to the restricted members' area containing detailed information on other EIBIR member institutions facilitating networking activities

— Support with EU projects

— Advance notice in EU affairs (announcements and calls for proposals)

The EIBIR membership is made up by clinical departments (two thirds) and research laboratories (one third), representing a large variety of expertise.

EXPANDED MEMBERS' AREA

The EIBIR online members' area has just recently been expanded by two new features: The contact information per EIBIR member institution has been elaborated in order to further promote networking activities. All member institutions can now list one contact person for each specialty as well as up to three main contacts. Secondly, all EIBIR members have the possibility to upload information on their ongoing and planned assessment studies to the website. The option to upload study protocols is also available. The aim is to create a comprehensive database of European assessment studies to help investigators find each other and facilitate collaborative efforts and multicentre studies. All members are encouraged to update the information on their research expertise regularly. If you need a reminder of your login data, please send an email to office@eibir.org.

COUNTRY	MEMBERS
AUSTRIA	6
BELGIUM	10
CZECH REPUBLIC	6
DENMARK	9
ESTONIA	1
FINLAND	4
FRANCE	26
GERMANY	32
GREECE	3
HUNGARY	2
INDIA	1
IRAN	1
IRELAND	5
ISRAEL	5
ITALY	23
KAZAKHSTAN	1
LUXEMBOURG	1
NETHERLANDS	12
NORWAY	2
POLAND	5
PORTUGAL	1
ROMANIA	3
RUSSIAN FEDERATION	4
SLOVAK REPUBLIC	1
SLOVENIA	2
SPAIN	18
SWEDEN	6
SWITZERLAND	13
TURKEY	4
UNITED KINGDOM	29
TOTAL	**236***

*as per December 2008

PORTRAITS OF EIBIR MEMBER INSTITUTES

In order to show you the variety of expertise in the EIBIR network, we will start a new series in this report.

In each episode of this series, which will be continued in future publications, we will present one or several EIBIR member institutes.

You will find details on the size and staff of the institution and on its specialisation and research expertise. Look out for the continuation in the next EIBIR publication!

If your institution is an EIBIR member and you would like to find your portrait in a future publication, please send us your short profile to office@eibir.org.

MEDISIP – Ghent University, Ghent, BE
Medical Imaging and Signal Processing (MEDISIP) is a research group of the department of Electronics and Information Systems (ELIS) of the faculty of Engineering (FIRW) from the Ghent University (UGent).

Size of institution
The MEDISIP group consists of 4 professors, 2 postdocs, 2 researchers and 15 PhD students.

Specialisation of institution
Medical digital signal and image processing, software development and data analysis; new centre for molecular and functional imaging for small laboratory animals; collection of state of the art infrastructure for molecular imaging towards preclinical research.

Motivation to join EIBIR
As one of the main European research labs in medical imaging with a strong focus on multimodality and small animal imaging, our group is interested in being in contact with other labs working in medical imaging. This mutual enhancement can improve the level of European research.

Expectations from EIBIR
Exchange with other leading labs, information about different opportunities in the domain of medical imaging.

Center of Functionally Integrative Neuroscience (CFIN), Aarhus University Hospital / University of Aarhus, DK, www.cfin.au.dk

Size of institution
CFIN engages approximately 75 researchers – Professors, post-docs, PhD students, Masters students, and research assistants and a technical/administrative staff
Head of institution: Leif Østergaard, M.D., M.Sc., PhD, D.Med.

Specialisation of institution
Cross disciplinary brain research for both basic research and applied medical research, trying to find new methods of improved diagnosis and treatment of different neurological diseases. 5 large research areas – neuroenergetics, neurotransmission, neuroconnectivity, functional haemodynamics and cognitive neuroscience, using all modern scanning technologies to investigate the human brain.

Motivation to join EIBIR
Exchange research ideas and results with other European research institutions and inspire additional international research collaborations; foster cutting-edge neuroscientific research in an environment where leading scientists work across traditional disciplines to generate new knowledge of the human brain and mind, ultimately improving the quality of life for patients with severe neurological and neuropsychiatric diseases.

Expectations from EIBIR
Overview of leading European research institutions within the biomedical imaging field, insight into the latest developments in imaging techniques, update on publications within the biomedical imaging field, exchange of students and courses (PhD), conferences and congresses within the field, newsletters.

San Raffaele Scientific Institute (SRSI), Milan, IT www.sanraffaele.org

Size of institution
The San Raffaele Scientific Institute (SRSI) has different locations worldwide. The Milan, Italy, location is a Biomedical Science Park, including the San Raffaele Hospital, with more than 1,300 beds, the Department of Biotechnologies (DIBIT) and the Vita-Salute San Raffaele University. The SRSI employs 3,700 staff members with different professional profiles. The research staff is composed of 550 scientists, technicians, postdoctoral fellows, PhD students and undergraduate students working in many different areas of biomedical science.

Specialisation of institution
Research includes genetics, cell biology, stem cell biology, gene therapy, immunology, and focuses on several diseases, namely cancer, transplant rejection, autoimmunity and infections, neurodegenerative, cardiovascular and metabolic diseases.

Motivation to join EIBIR
Networking activities, contribute and benefit from the exchanges of expertise among EIBIR members to promote a culture of cooperation between them.

Expectations from EIBIR
Support and transparency in the process leading to the constitution of large or small initiative groups aimed at getting better funding opportunities from EU programmes.

Some of you have already communicated with the EIBIR Office team by e-mail or telephone. We thought you might be interested in the faces to the already familiar names!

EIBIR OFFICE GETS A FACE

Monika Hierath studied interpreting in Vienna, spent one year in Brussels and worked as an interpreter for the Austrian Minister of Agriculture and Environmental Affairs before she joined the ESR as conference manager for ESMRMB, the European Society for Magnetic Resonance in Medicine and Biology, of which she became executive director in 2005. Since the beginning of 2007, Monika is in charge of running the head office of the European Institute for Biomedical Imaging Research (EIBIR), also based at the premises of ESR, as well as of ESR EU and public affairs. in her free time, Monika likes to unwind by playing Squash, jogging, skiing and hiking, but her true passion is sailing. She holds the yacht master licence and tries to get away at least three times a year to go on sailing trips.

Eva Haas studied tourism and travel management in Worms, Germany, before she started to work as project assistant for ECOTRANS, the Network for Sustainable Tourism Development in Europe. In 2005, highly experienced in working for EU projects, she became junior consultant in co-ordinating ecological and tourism-related projects on a national and international level. In November 2007, she took the chance to become Project Manager of European Projects at EIBIR in Vienna. In her leisure time, she likes jogging, hiking as well as reading travelogues and watching travel documentaries. She is passionate about Japan and its cuisine as well as finger food.

Anna-Maria Adaktylos studied English and linguistics in Vienna, Berlin (Germany), Salonica (Greece) and Poznan (Poland). Having worked as a research assistant and office manager, she decided to move to a more dynamic environment and joined EIBIR in April 2008. With a small child and a second to come soon, Anna hardly finds time for her hobbies learning languages, reading, going to the theatre and designing clothing.

Vera Schmidt studied acting and psychology in Vienna and gained international work experience during her residence in New York City. Having worked for the ECR on-site during the congress in Vienna as well as at many international radiological meetings since 1999, she joined EIBIR after ECR 2006. Her scope of activity includes the EIBIR website, members issues as well as support of her co-workers, when necessary. After work, Vera teaches acting to children, likes watching DVDs, going to the movies and to the theatre, she enjoys cooking and dining, loves the music of the 30ies and 40ies and is a passionate swing dancer.

EIBIR'S CO-SHAREHOLDERS UNDERLINE IMPORTANCE OF MULTI-DISCIPLINARITY IN BIOMEDICAL IMAGING RESEARCH

During 2008 we were pleased to officially welcome two new organisations as co-shareholders of EIBIR, the European Association of Nuclear Medicine (EANM) as well as the European Federation of Organisations of Medical Physicists (EFOMP), thus increasing the number of co-shareholder organisations to four.

Negotiations are underway with the European Organisation for Research and Treatment of Cancer (EORTC) and the European Federation of Societies for Ultrasound in Medicine and Biology (EFSUMB).

Co-shareholders are represented at the general meetings of EIBIR, where major strategic decisions are taken and recommendations are developed for the other bodies and initiatives of EIBIR and are invited to nominate a representative to the Scientific Advisory Board of EIBIR. Here you will find a profile of the four organisations.

COCIR, the European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry with headquarters in Brussels, is a non-profit trade association representing the medical technology industry in Europe. COCIR's aim is to represent the interests and activities of its members and act as a communication channel between its members and the European institutions and other regulatory bodies.

EANM, the European Association of Nuclear Medicine, is the umbrella organisation of nuclear medicine in Europe and represents the sector towards the European Institutions. Within this role, it aims at advancing science and education in nuclear medicine for the benefit of public health as well as at promoting and co-ordinating, throughout Europe and beyond, discussion and exchange of ideas and results relating to the diagnosis, treatment, research and prevention of diseases through the use of unsealed radioactive substances and the properties of stable nuclides in medicine.

EFOMP, the European Federation of Organisations in Medical Physics, currently has 34 national organisations and three affiliated national organisations which together represent more than 5000 physicists and engineers in the field of Medical Physics. The mission of EFOMP is to harmonise and advance medical physics at an utmost level both in its professional clinical and scientific expression throughout Europe, and to strengthen and make more effective the activities of the national member organisations.

ESMRMB, the European Society for Magnetic Resonance in Medicine and Biology, was founded in 1984 as a platform for clinicians, physicists and basic scientists with an interest in the field of MR. It aims to support educational activities and research in the widest sense in the field defined by the Society's name. The ESMRMB is open to physicians, engineers, scientists and other individuals who are interested in the developments or the introduction of magnetic resonance techniques in the fields of medicine and biology.

INDUSTRY SUPPORT PLAYS KEY ROLE IN ADVANCEMENT OF IMAGING RESEARCH

In August 2005, an Industry Panel was created by EIBIR in which all major companies in the field of biomedical imaging are represented, including hardware, contrast media and software companies. At the second industry meeting, which was held during ECR 2006 in Vienna, it was decided that the industry will be strongly involved in the efforts of EIBIR and most industry partners expressed their willingness to support the initiative.

Bayer Schering Pharma, Bracco, GE Healthcare, Philips and Siemens were the founding members of the EIBIR Industry Panel. The first two years they each contributed €50K to support establishing the structures of EIBIR, until during the EIBIR Industry Panel Meeting 2008 it was decided to reduce the annual contribution to €35K per company. We regret that Bayer Schering Pharma has not continued its former commitment in 2008.

With regard to the future support from the industry, EIBIR proposed a reduced annual support payment of €10K per company starting from 2010. This would be a reasonable amount for a larger number of industry partners and would thus allow EIBIR to broaden its liaison with industry in general and also to spread the risk in case of withdrawal of individual industry partners. EIBIR sent out a survey to medical companies in 2008 to seek dialogue with the medical imaging industry in order to help assess their interests and to allow improved collaboration and increased networking between research institutes and industry, as well as an efficient dissemination and exploitation of research findings. We received a great response and are currently evaluating the new input and ideas. Companies that showed great interest in our activities and would be suited within EIBIR are AGFA Healthcare, Carestream Health, COCIR, Covidien, Fuji, Guerbet, Hitachi and Toshiba. We very much hope that we will have the opportunity to welcome them to the industry panel shortly.

EIBIR relies on the continued support of its industry partners in order to secure sufficient funding of its initiatives apart from the EU support it receives for dedicated research projects. In addition, industry plays a key role in the advancement of the field of biomedical imaging. EIBIR looks forward to successful cooperation in the coming years.

BENEFITS FOR SUPPORTING INDUSTRY MEMBERS

Access to the restricted members' area of the website (incl. the fields of expertise of all EIBIR member institutions)

Representation in the Industry Panel, regular meetings and direct exchange with key representatives of EIBIR

EIBIR will provide input in the early stages of industrial development to translate new discoveries into industrial innovation.

Supporting industry members may offer research grants and thus co-operate with fundamental and clinical research institutions on new scientific developments.

Regular information and update on biomedical imaging research activities in Europe, EIBIR Newsletter, direct communication channels with Europe's leading biomedical imaging researchers

BRACCO
LIFE FROM INSIDE

GE Healthcare

PHILIPS

SIEMENS

Since its foundation in 2006, EIBIR has established four joint initiatives with the aim of founding specialised working groups for specific areas of research:

These include

— Biomedical Image Analysis
— Platform Cell Imaging Network
— Chemistry Platform
— European Network for the Assessment of Imaging in Medicine

Each of these initiatives is headed by an initiative director who acts as representative and coordinator. The initiatives have in the past proved to be very efficient, especially in the initiation of project ideas. In the following section, the initiatives and their representatives are presented.

EIBIR'S JOINT INITIATIVES TAKE THE LEAD IN INITIATING RESEARCH PROJECTS AT EUROPEAN LEVEL

BioMedIA fosters research and cooperation with industry in biomedical image analysis

The mission of the Biomedical Image Analysis Platform (BioMedIA) is to foster European collaboration between academic groups and industry in the area of biomedical image analysis. The platform aims to manifest itself as a representative of European biomedical image analysis research and development at the European and international level.

Background

Imaging technologies are core disciplines of today's and tomorrow's biology and medicine. In biomedical research, innovative imaging techniques zoom in on anatomy and function from the organ to the cellular/molecular level, thus providing unique insight into living systems, from biological model systems to patients. In clinical practice, medical imaging plays a prominent role in screening, diagnosis and staging of disease, therapy planning and monitoring, and guidance of interventions. The number of patient studies, the amount of data per patient, and the heterogeneity of the data have increased tremendously, a trend which is expected to continue.

In view of the prominent role of medical imaging in clinical practice and the rapid developments in biomedical imaging technology, biomedical image processing has become a very active and exciting area of research and computational techniques are a prerequisite to fully exploit the richness of the biomedical imaging data that is acquired in biomedical research and clinical practice. EIBIR's Biomedical Image Analysis Platform aims to bring together academic groups and industry, which are active in this field, in order to advance European research and development in this area.

Organisation
The Biomedical Image Analysis Platform was launched in 2007. A group of ten institutes, listed on the EIBIR website, was involved in setting up the organisation and activities of the platform.

Activities
European Collaboration: The group initiated a successful EC-funded research project. For details, see p. 21 of this report. In the coming years, the number of such initiatives will be increased and are also planned elsewhere in the world.

Education and dissemination
The Biomedical Image Analysis Platform will play an active role in both education in biomedical image analysis and in the dissemination of research results at international congresses such as ECR and a PhD summer school to be launched in 2009.

Provided by Fraunhofer MEVIS – Institute for Medical Image Computing

Consolidation of research results: This can for example be achieved by setting up a central web location, in which image analysis software, imaging data, evaluation software, and evaluation data can be stored.

Are you interested in details and in joining the platform? Please email to the EIBIR Office at: office@eibir.org.

Prof. Wiro Niessen
Director of the Biomedical Image Analysis Platform

Cell Imaging Network creates synergies to advance in vivo cell imaging

Cell-based therapies have become a major strategy in modern medicine. In such strategies, living cells are used to fulfil a variety of purposes. The living cells either fulfil the role as the "active drug component", for instance in the use of immune cells for anti-cancer treatment strategies, or they are used in regenerative medicine approaches to repopulate/repair damaged tissues that have no or limited self regenerative capacity, or they fulfil the role as a drug delivery vehicle as a means to improve bio-compatibility and crossing of the blood-brain barrier.

For the development and validation of such cell-based treatment strategies, it is crucial that the fate and action of the administered cells can be monitored in vivo, thus creating the need for in vivo cell imaging techniques.

Mission & aims
The mission of the Cell Imaging Network is to create an integrated network of chemists, biologists, physicists, computing scientists and physicians dedicated to the development and validation of robust imaging tools for in vivo cell imaging.

The aim of the Cell Imaging Network is to promote exchange of knowledge and expertise and collaboration between research institutes, universities, medical centres and industry involved in cell therapy and cell imaging research.

Specific objectives include the initiation, coordination and support of collaborative research efforts, the organisation of workshops and symposia, training and education of young scientists through exchange programs, as well as the creation of transnational access to state-of-the art equipment.

As a result of an early initiative by Dr. Monique Bernsen within the Cell Imaging Network, a proposal for a large integrative project called ENCITE was submitted in 2007 for EC funding. You will find details on the project on p. 18 of this report.

If you are interested in participating in, helping to build or support this network, you are invited to contact the EIBIR Office at office@eibir.org.

Dr. Monique Bernsen
Director of the Cell Imaging Network

Chemistry Platform focuses on development of imaging probes

The 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, which are listed on the EIBIR website. From this core group, 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 Chemistry Platform aims at tackling the following tasks:

- 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;
- to disseminate information inside the EIBIR community on relevant achievements related to the development of imaging probes;
- to implement contacts between chemistry groups active in the synthesis of new tracers/contrast agents and bio-medical research teams interested in their pre-clinical assessment.

The Chemistry Platform will devote special attention to activating initiatives with European companies active in the production of diagnostic probes for medical imaging. In particular, EIBIR laboratories may offer industry an array of pre-clinical collaboration to explore new applications for the products of their research as well to extend the use of established materials. The Chemistry Platform has initiated the submission of a proposal for an EU-funded project on the development of smart imaging probes.

Are you interested in details and in joining the platform? Please email to the EIBIR Office at: office@eibir.org.

Prof. Silvio Aime
Director of the Chemistry Platform

EuroAIM establishes CAD imaging consortium

The European Network for the Assessment of Imaging in Medicine was initiated because evidence for rational use of imaging technology is frequently lacking. EIBIR therefore decided to establish a network to assess radiological technology.

EuroAIM can help in forming consortia to perform meta-analyses, i.e. pooled analyses, of existing prospectively collected datasets using individual patient-level data from studies that are completed. Data that have been collected in studies in the past are re-analysed under different aspects and in correlation with data from other studies. This can be helpful to improve the power of studies, to improve generalisability of results, to explore differences across settings, and in forming collaborative teams for future prospective studies.

On initiative and under the lead of Prof. Myriam Hunink, the CAD (coronary artery disease) imaging consortium has been formed. Several sites have joined this initiative. Participants are kept informed via a Google Group website. Protocols for two pooled analyses have been written. Objective of the proposed analyses is to predict CAD in patients with chronic stable angina pectoris based on age, sex, type of chest pain, risk factors, and non-invasive imaging results. Data collection from the participating sites is in progress and the first analyses are being working on.

If you are interested in participating in the CAD consortium and if you have a prospectively collected dataset on patients with chronic stable angina pectoris who have undergone non-invasive imaging (any of the following: exercise testing/ stress echo/ SPECT/ PET/ MRI/ CTCA/ CT calcium scoring) and coronary angiography, please e-mail Myriam Hunink at m.hunink@erasmusmc.nl.

Prof. Myriam Hunink
Director of EuroAIM

The following pages will provide you with an overview of EIBIR's ongoing and recently submitted research projects, each representing Europe's top expertise in biomedical imaging.

Each of the projects is coordinated by EIBIR, meaning that it represents the link to the European Commission and is in charge of ensuring the implementation of the work plans and attainment of the overall objectives of the projects.

FP6 PROJECT JUMP-STARTS ESTABLISHMENT OF EIBIR

The first year of the project entitled EIBIR, funded by the European Commission within the 6th Framework Programme as a supporting action, was a big success. The project started in July 2007 with the aim to set up a network of clinical and non-clinical institutions interested and working in the field of biomedical imaging.

After the first year, the network has over 230 members in 30 countries, including top-notch scientific institutions and hospital departments.

Following the work plan of the project, organised in work packages, the following tasks were successfully finalised during the first project year: The project partners created and agreed upon a Research Policy Paper, which serves as a basis for discussion of research priorities in the field of biomedical imaging. You may order a copy by sending an email to office@eibir.org.

Another major step within the project has been the definition, organisation and management of joint or common initiatives. A number of joint initiatives have emerged out of the project, such as the Cell Imaging Network, the Biomedical Imaging Analysis Platform, the Chemistry Platform, as well as EuroAIM – the European Network for the Assessment of Imaging in Medicine. The initiatives are described in greater detail on page 13 of this report.

Exchange and dissemination of Good Practice has been another milestone of the project: The EIBIR community decided to agree upon guidelines on Good Research Practice (GRP) to ensure as high a quality standard in biomedical imaging research as possible. These guidelines can be downloaded on the EIBIR website.

Details on technical infrastructures, scientific expertise and activities also represents a key item of the project work plan. Details on the technical equipment, scientific expertise and activities of EIBIR member institutions have been collected in a database which can be assessed by EIBIR members on the EIBIR website. The database allows for the pooling of resources and the creation of synergies, in particular when setting up consortia for new research projects.

A major part of the project consists of the coordination of conferences, meetings and training courses. An online event calendar was set up on the EIBIR website.

INSIGHT INTO EIBIR'S EU-FUNDED RESEARCH PROJECTS

What's next?
During the second and final project year, which will end in June 2009, the work of the joint initiatives mentioned above will be further supported and the set-up of further joint initiatives will be encouraged. In addition, a database with examples of Good Practice will be set up and filled in by the partners. This project part is currently being developed and will be online soon, to be accessed in the members' area of the EIBIR website.

A thorough revision of the EIBIR website, ensuring easy access to all information and improved usability, has been started and is expected to be completed in early 2009. Along with this, it is planned to revise the corporate design of EIBIR to establish an easy-to-distinguish and harmonised look for all publications in the future.

One aspect that will only start during the second half of the project is the coordination of multi-centre trials. This work package has undergone relevant changes in comparison to the original work plan. Due to the extreme difficulty and high cost of developing new multi-centre trials, the consortium decided not to develop new trials, but to work with existing ones. An inventory of existing clinical trials in Europe is currently being collected by the partners in a database accessible via the website of EIBIR.

After data on existing trials have been submitted to a database, a web page will be developed in order to give EIBIR member institutions access to this information. In addition a survey on pharmaceutical trials has been launched, in which both EIBIR members as well as companies are invited to participate.

The project will be rounded off by a final review and report to the European Commission in June 2009.

SIXTH FRAMEWORK PROGRAMME

EIBIR | EUROPEAN INSTITUTE FOR BIOMEDICAL IMAGING RESEARCH

STEM CELLS IN THE SPOTLIGHT

The project ENCITE – European Network for Cell Imaging and Tracking Expertise – was submitted to the call HEALTH-2007-1.2-4 "In vivo image-guidance for cell therapy" and is funded by the European Commission within the 7th Framework Programme with roughly €12m.

This large integrated project consists of 21 project partners (listed at www.encite.org) with leading expertise in the field of cell imaging, with EIBIR as the coordinating partner. The 4-year project began on June 1st, 2008.

Currently, there is no single imaging modality that meets the requirements of stem cell therapy. Within the framework of the project, new MRI imaging methods and biomarkers will be developed and tested in order to get a more comprehensive picture of the cell fate and the reaction of the immune system. Eventually, these are planned to be applied in the treatment of cancer, cardio-vascular diseases and diabetes. After just half a year since the official start of the project ENCITE, its scientific activities are now in full swing. We are pleased to provide you with an overview of the scientific progress achieved by subproject.

SEVENTH FRAMEWORK PROGRAMME

ENCITE

SUBPROJECT 1
Novel Imaging Technologies

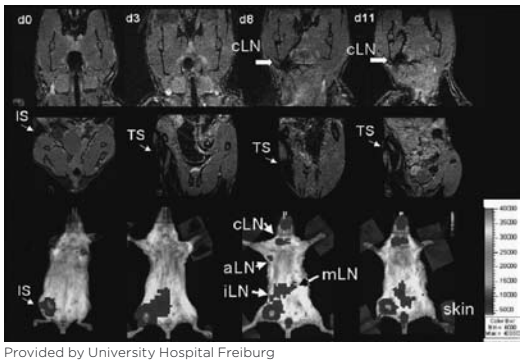
The Subproject is led by the University of Freiburg, Germany, with the aim to achieve methodological developments of MR imaging methods.

The objective of this Subproject is to provide new imaging methods to improve the spatio-temporal tracking of labelled cells, to develop new methods for quantitative assessment to generate reliable biomarkers of the cell fate and therapeutic effects as well as novel image post-processing techniques to allow stable and reproducible evaluation of experimental results. This includes tools for visualisation, co-registration as well as algorithms for quantitative evaluation.

The first few months of the project were dedicated to the implementation and testing of key methods for use in the project. Development of methodology has focused on methods for tracking with USPIO-labelled agents. A 3D cell-tracking method based on a 3D-FLASH sequence was successfully implemented and used to track labelled dendritic cells following allogeneic hematopoietic cell transplantation in a mouse model.

Currently, a survey to assess specific needs for new methods is under preparation as a first step towards implementing the work plan. This will be used to develop specifications for method and software packages for use by the application groups.

With respect to the aim of developing advanced methods and protocols for cell characterisation, measurement techniques for characterisation of tumour neoangenesis by dynamic contrast enhancement (DCE-MRI) based on a IR-trueFISP sequence for direct quantitative T1-measurement has been implemented and tested on mice.



Provided by University Hospital Freiburg

Initial work on work package 1.2. (image post processing tools) has focused on the development of postprocessing tools to analyse DCE-MRI data and for semi-automated morphometric evaluation.

SUBPROJECT 2
Novel Imaging Reporter Probes

This Subproject is led by the University of Torino, Italy, with the aim to increase the number of available reporter genes for MRI by evaluation of novel candidate reporters. In addition, this Subproject will significantly expand the utilisation of MRI reporter genes, applying them for monitoring not only for the constitutive expression of genes, but also for detection of changes in gene expression and imaging of cell differentiation.

So far no imaging approach has been reported for direct detection of cell proliferation, bioluminescence imaging has been used for determination of increases in cell number. By combining strategies for simultaneous imaging of cell proliferation, differentiation and death multi-parametric information on the state and fate of the delivered cells will be retrieved. Development and validation of such strategies will also be a focus point in Subproject 3.

ENCITE consortium members at the kick-off meeting in Freising, Germany, in June 2008.

SUBPROJECT 3
Novel Tools for Cell Labelling

This Subproject is led by the Weizmann Institute, Israel. Apoptosis is a cell death process which plays an important role in the development of multicellular organisms and in the regulation and maintenance of cell populations in tissues upon physiological and pathological conditions. The aim is to establish a technique that will enable to capture intra-cellular protein interactions known to occur during apoptosis. Such a method would be valuable for in-vivo imaging and for identifying new proteins involved in the apoptotic process using siRNA screens. This work is a collaboration between the labs of Profs. Michal Neeman and Atan Gross, both from the Department of Biological Regulation at the Weizmann Institute.

SUBPROJECT 4
Pre Clinical Validation

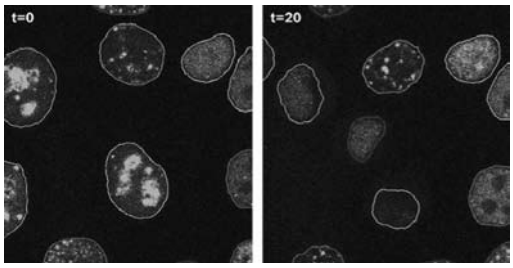
This Subproject is lead by the Erasmus Medical Centre Rotterdam, the Netherlands, and will validate the generic tools developed under Subprojects 1 to 3 and develop specific tools relevant to 5 major fields of cell therapy application. Within each of the work packages, staff has been hired and initial studies have been started. Studies relevant to cellular imaging of de novo tissue formation and in vivo imaging of cell fate, in vivo visualisation of neurogenesis and angiogenesis are in progress and plans relevant to task simultaneous monitoring of graft survival and immune response are being made. As far as the musculoskeletal field is concerned, studies with regard to the characterisation of musculoskeletal tissues at physiological and pathological states and stem cell tracking in musculoskeletal disease have been initiated according to schedule and are in progress, as is the case in the field of diabetes.

With regard to dendritic cell therapy, studies relevant to in vivo visualisation of DC-NK cell interaction have been initiated according to schedule.

As far as cancer T-cell therapy is concerned, studies relevant to the migration and homing efficiency of adoptively transferred T cells, activation of adoptively transferred T cells, cytolytic effector functions and imaging interactions between T cells and stroma, have been initiated according to schedule and are in progress. A single colour mouse tumour model has already been developed for monitoring the dynamics of tumour and tumour microenvironment.

SUBPROJECT 5
Translation towards Clinical Applications

This Subproject is led by the Radboud University Nijmegen Medical Centre, the Netherlands. The group exploited dendritic cells (DC) to vaccinate melanoma patients and recently demonstrated a statistical significant correlation between favourable clinical outcome and the presence of vaccine-related tumour antigen specific T cells in delayed type hypersensitivity (DTH) skin biopsies. However, favourable clinical outcome is only observed in a minority of the treated patients. Therefore, it is obvious that current DC-based protocols need to be improved. For this reason, the fate, interactions and effectiveness of the injected DC are studied in small proof-of-principle trials.



Provided by Erasmus Medical Center Rotterdam

Dendritic cell immunotherapy has been introduced in the clinic. It has proven to be feasible, non-toxic and effective in some cancer patients, particularly if the DC are appropriately matured and activated. However, many questions still remain. One of the concerns related to ex-vivo generated DC is how to ensure effective migration to the T cell areas in the lymph node.

Portraits of dedicated staff as well as more detailed updates on progress reports are available at the ENCITE project website www.encite.org.

ENCITE LAUNCHES COMPETITIVE CALL

In order to complement the expertise represented by the 21 project partners, ENCITE seeks additional partners to provide input to certain work packages and specific issues related to cell imaging and cell tracking to be addressed by the project.

To this end, a competitive call was published in early 2009. The deadline for submissions is March 25, 2009. More information at www.encite.org.

MOLECULAR IMAGING TRAINING WORKSHOP IN PRAGUE

A workshop on molecular imaging is planned to take place at the congress centre of IKEM in Prague on May 7–8, 2009.

The programme of the public workshop will be designed and held by the ENCITE consortium and include progress reports of the project as well as other major aspects and latest advances in the field of molecular imaging. Please visit www.eibir.org or www.encite.org for more information and registration.

IMPROVING EARLY DETECTION AND DIAGNOSIS OF BREAST CANCER

The project HAMAM – Highly Accurate Breast Cancer Diagnosis through Integration of Biological Knowledge, Novel Imaging Modalities, and Modelling – is funded by the European Commission within the 7th Framework Programme with a total of €3.1m.

The 3-year project started in September 2009 and consists of 9 international scientific partners from six countries (listed at www.hamam-project.eu), with EIBIR as coordinating partner.

Despite tremendous advances in modern imaging technology, both early detection and accurate diagnosis of breast cancer are still unresolved challenges. Unnecessary biopsies are taken and tumours frequently go undetected until a stage where therapy is costly or unsuccessful. HAMAM will tackle this challenge by providing a means to seamlessly integrate the available multi-modal images and the patient information on a single clinical workstation. HAMAM is a successor of the very successful EU projects SCREEN and SCREEN-TRIAL. With HAMAM, Europe has the potential to strengthen its leadership in the whole area of image-based breast cancer diagnoses. We are pleased to provide you with an overview of the scientific progress achieved at work package level during the first months of the project:

SEVENTH FRAMEWORK PROGRAMME

HAMAM

WORK PACKAGE 1
Clinical and diagnostic requirements

This work package is led by MEVIS Research GmbH. The overall objective is to bring together scientists, clinicians, and engineers in order to review the relevant existing knowledge and data sources and to prioritise the specific requirements of the project.

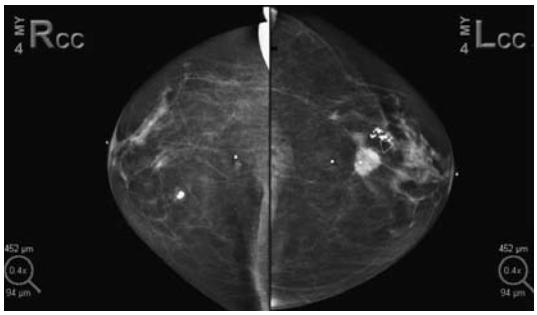
The clinical project partners together with the clinical advisory board will define detailed requirements from a clinical perspective regarding the role of the different modalities for specific clinical questions, the tools needed for multi-modal diagnosis, and the clinical workflow represented by a set of use cases. Based on this, software engineers and IT researchers will specify the architecture as well as relevant interfaces of a software prototype for multi-modal diagnosis of breast cancer.

The kick-off meeting in Bremen, Germany, on October 20–21, 2008 was very productive and enabled the laying out of a detailed work plan for the first project year.

Finally, the work package comprises the design and definition of a database for anonymised clinical data including lifestyle risk factors, histopathology, family history information and genetic test results both mutation analysis of known high penetrance breast cancer genes and polymorphisms at loci known to predict breast cancer risk. To this end, a workshop will be held back-to-back with ECR 2009.

WORK PACKAGE 2
Development of multi-modal environment

This work package is led by MEVIS Medical Solutions. As part of the specification of the multi-modal workstation for breast cancer diagnosis to be developed by MeVis Medical Solutions, efforts in Task 2.1 and Task 1.3 have been focused on evaluating to what extent the project specific requirements are already fulfilled by the software modules which are part of the proprietary application platform MeVisAP.



Provided by Fraunhofer Mevis Medical Center

Based on the requirements for the clinical scenarios identified during the HAMAM Kick-Off Meeting in Bremen, missing software components providing basic functionalities such as data import or standard visualisation and interaction techniques have been identified, primarily in the context of the new modalities like tomosynthesis, PEM and 3D breast ultrasound. Missing software components have been scheduled for development.

During a meeting with the project partner Eidgenoessische Technische Hochschule Zuerich in Bremen, topics related to the data connection between the workstation prototype and the HAMAM database were discussed, including the type of data that has to be exchanged, data formats as well as outlines for software interfaces. The results of this discussion have to be jointly worked out in greater detail by all project partners.

WORK PACKAGE 3
Imaging spatial correlation

This work package is led by the University College London. The aim of this work package is to establish spatial correspondence between regions of the breast acquired by different image modalities to enable effective synthesis and visualisation of multi-modal data for the detection and diagnosis of breast lesions. Intra-modality image registration will be provided for intra-modality fusion of 3D ultrasound images and for the alignment of the DCE-MR images. Temporal registration methods will be developed to support the detection and diagnosis of lesions as well as the estimation of therapeutic response.

WORK PACKAGE 4
Model-based analysis of integrated imaging data

This work package is led by Radboud Universiteit Nijmegen (RUNMC). The overall objective is to research image-derived quantitative diagnostic tissue model parameters focused on breast cancer detection, discrimination and therapeutic effect. A multi-modal strategy will be followed integrating results of work packages 3 and 5 into the research. The results of this work package will be added to other patient-specific multi-disciplinary data and used to define an integrated assessment in work package 5.

Preparations were made to collect cases and literature research was performed to learn about the most recent developments in the field. It was decided to first focus on research and development of breast MRI parameters, because MRI data is readily available at RUNMC. For reliable and automated feature extraction, segmentation of the various tissues encountered in breast MRI has to be performed.

A whole breast ultrasound unit is planned to be installed at RUNMC. At MEVIS Research GmbH, some preliminary work with 3DBUS has started. Initial experience with a few cases that are available indicates that stitching of different views and correction of motion artefacts are relevant issues to investigate.

WORK PACKAGE 5
Integration of multi-disciplinary data_

This work package is led by Eidgenoessische Technische Hochschule Zuerich. The principal objective is to centralise the heterogeneous data collected by all partners in a structured fashion, and fuse this multidisciplinary information for extracting new insight about breast cancer diagnosis and detection.

The first step is to define a common representation for the multidisciplinary data which is compatible with both clinical requirements and objectives, and machine learning methods that shall be employed for extracting useful associations from the database (Feb. 2009). Consequently, visits are being scheduled with all partners in order to collect the specific types of data they produce, as well as their own needs, in order to reach a consensus.

In parallel, data transfer agreements will be set up with the clinical partners, so that ethical and legal issues, related to the hosting of sensible data in the centralised database server, are solved before the data collection phase begins.

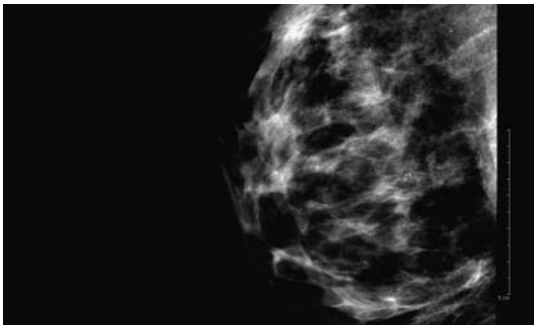
WORK PACKAGE 6
Technical validation and verification

This work package is led by MEVIS Research GmbH. The objective of this work package is the validation and verification of the software application, algorithms and project database developed in HAMAM. The official start date is September 2009. Nevertheless, single work will start as soon as preliminary results are obtained in the tasks of the other work packages.

Dr. Kathy Schilling from Boca Raton Community Hospital (United States) discusses the project work plan with Prof. Ulrich Bick from Charité Berlin (left) and Clinical Advisory Board member Prof. Roland Holland from University Hospital Nijmegen at the kick-off meeting.

WORK PACKAGE 7
Clinical validation and verification

This work package is led by Radboud Universiteit Nijmegen (RUNMC). As the project is very strongly clinically oriented validation will play a major role. Activities in this work package will start in September 2009.



Provided by Boca Raton Community Hospital, USA

Portraits of dedicated staff as well as updates on progress reports are available at the HAMAM project website www.hamam-project.org.

EIBIR LEADS CONSORTIUM IN SUBMITTING PROPOSAL ON SMART AGENTS

EIBIR has put together a consortium of excellence to submit a proposal for the call on 'Activatable or smart in-vivo imaging agents reporting on physico-chemical or molecular changes relevant to the diagnosis and/or monitoring of diseases' published within the EU FP7 programme HEALTH. The initial planning meeting took place in Nice/FR on September 13 and provided a good opportunity to define the participating expertise as well as a draft outline of the work programme.

The project, which was submitted on December 3, 2008, consists of 15 partners, with EIBIR taking on the role as coordinator under the scientific lead of Prof. Silvio Aime from Torino, Italy. First evaluation results from the European Commission are expected in March/April 2009.

The majority of approved imaging agents report about the anatomical structure or, upon suitable functionalisation, they report on the distribution of given target-molecules such as receptors or transporters. So far, it is not possible to provide maps of values of physico-chemical parameters such as pH and pO2 or of specific enzymatic activities.

As far as pH mapping is concerned, the obtainable information is absolutely new as there is currently no tool to visualise the pH values in organs and tissues. Therefore, an important task is to associate the pH changes with patho-physiological processes in order to extract diagnostic information from the maps reporting the variation of this parameter. pO2 mapping is already under intense scrutiny as it is well established that low oxygenation rates strongly affect the success of radio and chemo-therapies in cancer treatments. Its values are basically assessed through the evaluation of the redox state of the involved cells via the cellular entrapment of radioactive tracers that undergo peculiar transformations in response to the overall reducing capability of the intracellular environment.

More specific agents are needed that couple specificity of the response with a better spatial definition of the distribution of the pO2-parameter. Of course, the development of highly sensitive pO2-responsive agents would be of paramount importance in functional MRI investigations.

The third class of responsive agents that will be developed in the project will deal with systems that allow the quantitative visualisation of the activity of a given enzyme in selected tissues and organs. Enzymes are at the crossover of all the fundamental biological functions and are therefore privileged targets for a number of drugs for the most relevant diseases. The possibility of acquiring images that report on actual activity levels in "in vivo" organisms would be of invaluable importance for pursuing early diagnoses and an efficient monitoring of therapeutic treatments. Among the number of enzymes that can be addressed we will focus on systems relevant to tumour progression. The obtained results can easily be exported to design new agents responsive to other enzymes.

Finally, the project will consider imaging agents that are activatable by the action of external stimuli (e.g. ultrasound or heat). The use of such systems will be particularly valuable in procedures dealing with imaging of drug delivery including transfer of genetic material. The project will be centred on the development of MRI and Optical Imaging agents (that appear more amenable for endowing the responsive capabilities), but it will also use nuclear tracers, in particular in the set-up of dual imaging probes.

The overall aim of this project is to design systems that provide maps of values of physico-chemical parameters such as pH and pO2 or of specific enzymatic activities. The obtained maps will be fused with anatomical images to provide a completely new information content that was not previously accessible with the currently used structural or targeting agents.

PREPARATION OF NUCLEAR MEDICINE PROJECT PROPOSAL STRESSES MULTI-DISCIPLINARY CHARACTER OF EIBIR

Yet another project proposal has been prepared under the FP7 HEALTH Call, this time in the field of nuclear medicine on the evaluation of the potential health impact of diagnostic imaging agent doses.

The deadline for submission of the proposal entitled PEDDOSE.NET and consisting of 5 project partners was December 3, 2008. The project is coordinated by EIBIR and scientifically led by Dr. Michael Lassmann from the University of Würzburg. It is fully supported by EANM, the European Association of Nuclear Medicine, which is a co-shareholder organisation of EIBIR. First evaluation results from the European Commission are expected for March/ April 2009.

The aim of this proposal is to provide data on dosimetry and corresponding dose related risks when administering radiopharmaceuticals for diagnostic purposes in children and adults. The composition of the consortium ensures that contacts to other bodies such as the International Commission on Radiological Protection (ICRP), the Medical Internal Radiation Dose (MIRD) Committee of the Society of Nuclear Medicine or member state radiation protection agencies are provided in order to obtain up-to-date information on the developments in this field. In addition, data on imaging device-specific parameters and corresponding phantoms will be gathered in order to get information on potential dose reductions with emphasis on paediatric nuclear medicine procedures, and on computed tomography absorbed doses in hybrid scanners. If, as a result of the reviews, the need for additional clinical trials is identified, details for the set-up of such trials will be given.

Finally, recommendations for weight-dependent minimum and maximum activities with particular emphasis on paediatric nuclear medicine will be developed. The dissemination of results will be coordinated by EIBIR and undertaken with the help of the radiation protection authorities in individual member states and the EANM.

EIBIR RESEARCH FUND FOR THE FUTURE OF RESEARCH TRAINING

The EIBIR RESEARCH FUND was launched at the European Congress of Radiology (ECR 2008) by the European Institute for Biomedical Imaging Research (EIBIR).

The exclusive purpose of the fund is to provide research training in the field of biomedical imaging and thus secure a good foundation for radiology research and education in Europe. EIBIR is a non-profit limited liability company that was founded in 2006 by the European Society of Radiology (ESR) with the aim to co-ordinate and support the development of biomedical imaging technologies and the dissemination of knowledge with the ultimate goal of improving diagnosis, treatment and prevention of disease. Donations can be made by credit card or bank transfer at www.eibir.org and in the My User Area of the ESR website at www.myesr.org.

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