Euro-BioImaging

European Research Infrastructure for Imaging Technologies in Biological and Biomedical Sciences

WP8 Molecular Imaging

Task 8.1
Organization of meetings

Deliverable 8.1
Report on meetings to explore current/future dev. in molecular imaging and their demand for access

Task leader
WWU, UNITO, EMBL, CRG

June 2011

Deliverable 8.1
Report on meetings

June 2011

1 Executive summary

The aim of Euro-BioImaging, a project on the roadmap of the European Strategy Forum on Research Infrastructures (ESFRI), is to provide scientists throughout Europe open access to state-of-the-art imaging technologies at all levels of biological and biomedical research, from bench to bedside. Within this project, WP8 deals with imaging technologies related to Molecular Imaging and will pave the way for implementing an integrated imaging infrastructure for both probe development and imaging technologies for molecular imaging, including multi-tracer and multi-modal molecular imaging applications in model animals as well as emerging tissue imaging technologies. In this way, this WP will bridge the gap between basic biological imaging and clinical medical imaging.

2 Introduction

In order to develop such a pan-European infrastructure for molecular imaging in a harmonized, coordinated and well-balanced way, considerations of the expectations, needs and requirements of all interested parties are required. One important and effective way to gain insight in the necessities desired by the research community is to interrogate the audience at dedicated molecular imaging meetings.

3 About the deliverable and the work package/task

3.1 Objective

Organize meetings, bringing together life scientists and leaders in innovative molecular imaging technology and probe development in order to explore current and future developments in molecular imaging and the need for wide access to these technologies at the European level.

3.2 Approach

The first WP8 meeting with the community of Molecular Imaging scientists was conducted as a plenary session during the European Molecular Imaging Meeting - EMIM 2011 in Leiden, the Netherlands, organised by the European Society of Molecular Imaging – ESMI. This venue was highly suited for the purpose of the Euro-BioImaging WP8 meeting as ESMI aims at fostering the coherence of a sustainable European Molecular Imaging Community with the common goal to translate fundamental research discoveries into medical application and health benefit for the European Society and is supported by an efficient interaction and cross-communication with industrial partners. Over 400 researchers attended EMIM, of which 110 participated to the EuroBioImaging plenary session. Under these 110 participants many major actors within the MI field in Europe took actively part in the lively discussion, such as Prof. Bengt Langstrom (Uppsala); Prof. Holger Grüll (Eindhoven); Prof. Marion de Jong (Rotterdam); Dr. Herve Boutin (Manchester); Prof. Vasilis Nziachristos (Munich); Prof. John Clark (Cambridge); Prof. Bernd Pichler (Tübingen); Prof. Michael Ebmeier (Würzburg); Prof. Chrit Moonen (Bordeaux); Prof. Toni Lahoutte (Brussels); Prof. Daniela Perani (Naples); Prof. Bertrand Tavitian (Paris).

3.3 Results

During the first WP8 meeting the following issues raised:

I) infrastructure most needed in the field of Molecular Imaging

The need for a large variety of imaging modalities as well as a probe repository was widely accepted throughout the attendees of the session.

Special needs for specific single technologies were not discussed, which was most likely due to the assumption that such specific technologies will be present at EuroBioImaging nodes. Specific needs regarding infrastructure mainly involved the need for **access to sites that offer multi-modal imaging with proper image processing and validation** or specific applications, particularly **image-guided drug delivery/drug-guidance**.

II) *Harmonization of resources* across Europe to support a more efficient usage

A major limitation within the MI field is the wide variety of rules and regulations (e.g. legal and ethical requirements for animal experiments) within Europe, hampering an efficient transnational collaboration as well as the scattered availability of specific information/resources, making access to MI technology burdensome. Thus, there is a need for:

(a) **common European ethical/legal framework to facilitate flow of sample, probes, animal model systems etc.**
- dealing with MTAs, IP issues, ethical rules, etc.
- lobbying relevant European institutions (in collaboration with WP2)

(b) **specific databases** of pan-European information: e.g. imaging results, gold-standards, normal volunteers, image processing, quantification and validation, current ethical/legal requirements (in collaboration with WP11)

(c) **probe repository:** a probe repository should cover both chemical and biological probes and should feed into existing biomarker resources, connected to systematic in-vivo validation / toxicity testing
- linked to the idea of quality assurance standards
- seek advice from the (large) bio-banking community on how to make this work

(d) **nodes for basic scienc**e: within the MI field there is the recognition that future applied technology depends on today's basic fundamental science, which is being eroded and which leads to the need for basic science infrastructure, e.g. a "**chemistry node**", "**multi-modality node**". For instance, an integrated multimodality animal imaging node should ideally combine several medical imaging technologies (e.g. µPET/CT, µSPECT/CT, US, µMRI, BLI, fluorescence imaging, optical tomography) and supporting techniques (e.g. dedicated animal housing, facilities for autoradiography, ex-vivo gamma counting, immune histochemistry, microsurgery, radiotherapy) as well

as provide adequate interdisciplinary driving force from various disciplines such as medicine, biology, radiochemistry, physics, mathematics, computer sciences to achieve a high level of competence and to further guide developments in the MI field in all of its aspects and challenges. Some examples of such small animal multi-modality imaging nodes in Europe already exist and should be further developed.

(e) **sustainability of resources**, both funding and staff
- funding: regional/national/European
- staff: staff sustainability can be realized by (i) training and education - providing a stronger next generation of broad-minded, talented imaging researchers and by (ii) career structure - recognizing the value of expert technicians etc. with long-term job security and attractive salaries

However, care must be taken that such **coordination and harmonization don't result in too much centralization**. The **existing infrastructures** should be **upgraded** and **enhanced** but not overregulated.

4 Conclusion

The very large majority of contributions to the debate were highly positive to the idea of further building up the European infrastructure within the field of Molecular Imaging. First steps towards an integrated MI infrastructure have been already started by key EU projects in the past (such as EMIL (FP6), DiMI (FP6) and ENCITE (FP7)) by the establishment of the European Society for Molecular Imaging (ESMI, www.e-smi.eu), the European Master in Molecular Imaging (EMMI, www.e-mmi.eu) and various Technology and Training Platforms (TTPs), which combined key MI technologies with extensive training activities. The achievement of this task has been considered of great relevance to enhance the synergism among the interested groups and, in turn, to further improve the European role in the field of Molecular Imaging.

This consultation-link with the Molecular Imaging community will be maintained in the future, first of all through the reappraisal of the debate and also on the basis of the results of the survey and the sharing of data the WP leaders will assemble on the active MI centres in Europe in the forthcoming months.

5 Appendix

1. Agenda of the EMIM 2011 Meeting in Leiden, the Netherlands, that hosted the first Euro-BioImaging WP8 meeting.

2. PowerPoint presentation of the first Euro-BioImaging WP8 meeting.

	Sunday - 19 June 2011		Monday - 20 June 2011		Tuesday - 21 June 2011	
	Aalmarktzaal		Aalmarktzaal		Aalmarktzaal	
room	Aalmarktzaal	Breezaal	Aalmarktzaal	Breezaal	Aalmarktzaal	Breezaal
07:30-08:00			Registration			
08:00-08:30			**ESMI Plenary Lecture 2** Robert Gillies: **Heterovalent Targeting** Chairs: Arend Heerschap, Kevin Brindle		**ESMI Plenary Lecture 4** Daniel Anthony: **Imaging Inflammation with Targeted Contrast Agents** Chairs: Klaas Nicolay, Hervé Boutin	
08:30-9:00						
09:00-9:30	Registration, poster set-up, exhibitor's set-up		PS 5: Imaging Cancer Treatment and Evaluation (ESR) Chairs: Fabian Kiessling, Frauke Alves	PS 6: *ex vivo* and *in vivo* Microscopy and Cell Tracking (ENCITE) Chairs: Mathias Hoehn, Boudewijn Lelieveldt, Hans Tanke	PS 11: Neuroinflammation and Neurodegeneration Chairs: Sabina Pappatá, Bertrand Tavitian, Andreas Jacobs	Industry Round Tables (organised by ART, GE Healthcare, Visualsonics, Bruker, Bioscan/Philips, Caliper, Li-Cor, PerkinElmer)
09:30-10:00		Educational Session ENCITE/ESMI **Cell Tracking with OI and MRI** Chair: Mathias Hoehn				
10:00-10:30						
10:30-11:00			Guided Poster Walk Session, Exhibition with coffee			
11:00-11:30	Opening Ceremony and Inaugural Lecture on **Metabolic Imaging in Health and Disease** Sir George C. Radda Chairs: Clemens Löwik, Silvio Aime					
11:30-12:00						
12:00-12:30			PS 7: Theranostics (EANM/COST BM0607) Chairs: Marion de Jong, Tony Lahoutte	PS 8: Imaging in Drug Discovery and Development Chairs: Uwe Haberkorn, Adriaan Lammertsma	PS 12: Image Guided Surgery Chairs: George Themelis, Alexander Vahrmeijer	PS 13: (Hybrid) Imaging Technologies Chairs: Klaas Nicolay, Bernd Pichler
12:30-13:00	PS 1: Molecular Neuroimaging Chairs: Louise van der Weerd, Annemie van der Linden	PS 2: Image Guided Therapy (COST 06) Chairs: Silvio Aime, Chrit Moonen				
13:00-13:30						
13:30-14:00			"How should we develop the European Infrastructure in the field of MI" (EuroBioImaging) Chairs: Andreas Jacobs, Silvio Aime, James Sharpe, Carsten Schultz		**ESMI Plenary Lecture 5** Nadine Peyriéras **Visualization of Protein Tubules Involved in Cell Division and Cell Boundaries in Live Embryos** Chairs: Bertrand Tavitian, Jouke Dijkstra	
14:00-14:30	Opening of Exhibtion, Light Lunch					
14:30-15:00			14:15 Lunch break & Exhibition		Light Lunch & Closing of Exhibition	
15:00-15:30	PS 3: Probes/Chemistry (COST D38) Chairs: Eva Tóth, Frédéric Dollé	PS 4: Biomedical Applications of Photonics (IOP photonics) Chairs: Clemens Löwik, Vasilis Ntziachristos			ESMI Plenary Session and Closing Ceremony	
15:30-16:00			PS 9: Imaging in Cardiovascular Disease (ESR) Chairs: Nicolas Grenier, Markus Schwaiger	PS 10: Reporter Systems and Reporter Animals for Molecular Imaging Chairs: Michal Neeman, Chiara Roncoroni		
16:00-16:30						
16:30-17:00	ESMI Plenary Lecture 1 Ton van Leeuwen: **Promises and Pitfalls of Photo-Acoustic Molecular Imaging with Gold Nanoparticles and** Hong Zhang: **Construction of upconversion Photonic Nanoplatform for Bioimaging and Photodynamic Therapy of Cancer** Chairs: George Themelis, Eric Kaijzel					
17:00-17:30			ESMI Plenary Lecture 3 Gero Miesenboeck: **Lighting up the brain** Mark Lythgoe: **Optogenetics and MRI: shedding light on the brain** Chairs: Veerle Baekelandt, Jorge Ripoll			
17:30-18:00	Opening Reception and Exhibition					
18:00-18:30			ESMI General assembly			
18:30-19:30						
19:30			Beach Party			

How should we develop the European Infrastructure in the field of Molecular Imaging ?

Aime S, Jacobs AH, Sharpe J, Schulz C

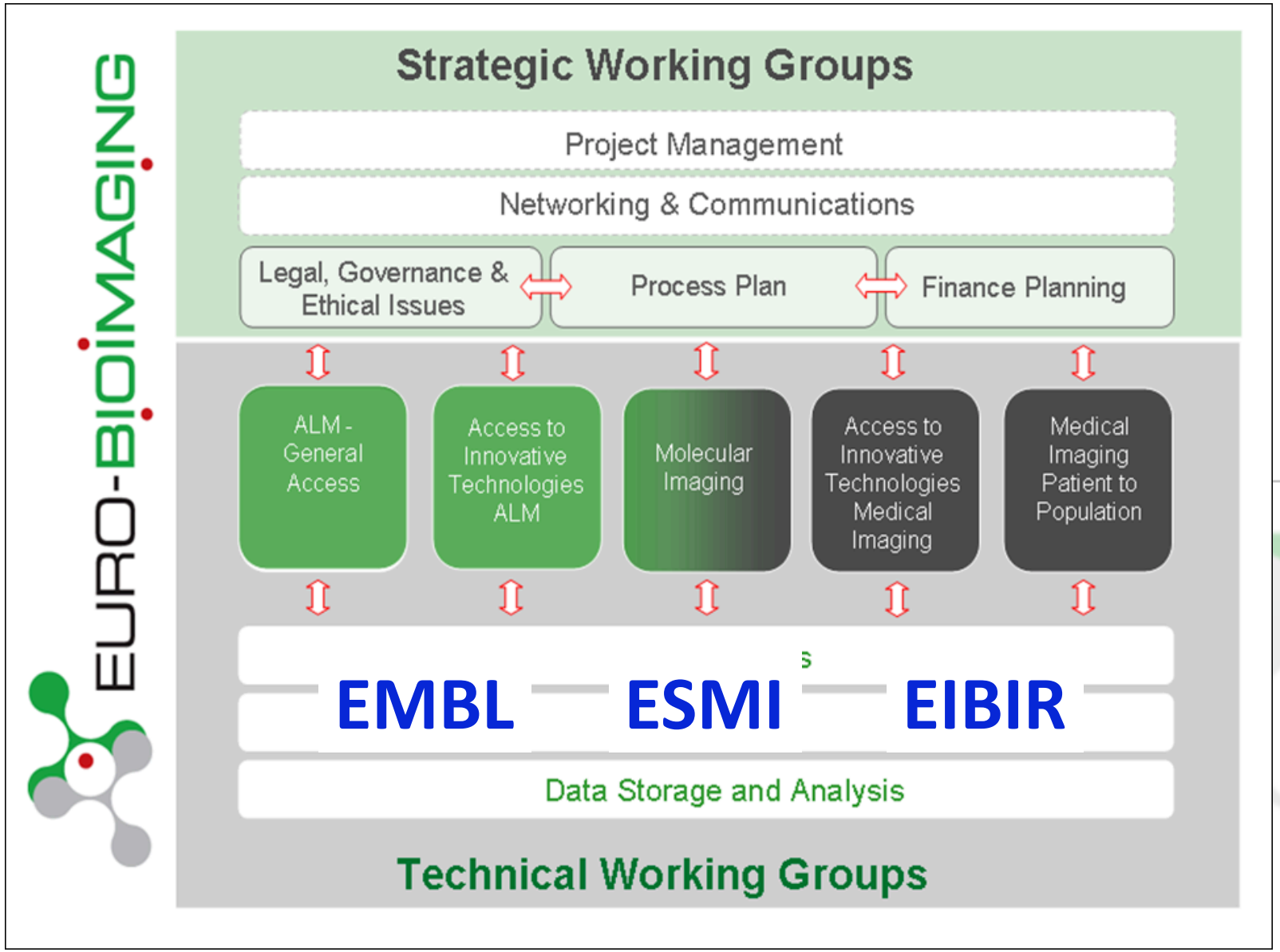
Torino, Münster, Barcelona, Heidelberg

WP8 Molecular Imaging with EuroBioImaging

EMIM – Leiden – 20.06.2011

Euro-BioImaging

1 of 4 new biomedical sciences projects included in the **European Strategy Forum on Research Infrastructures (ESFRI)** roadmap update (published in December 2008)


EURO-BIOIMAGING
Strategic Working Groups
Project Management
Networking & Communications
Legal, Governance & Ethical Issues
Process Plan
Finance Planning
ALM - General Access
Access to Innovative Technologies ALM
Molecular Imaging
Access to Innovative Technologies Medical Imaging
Medical Imaging Patient to Population
EMBL
ESMI
EIBIR
Data Storage and Analysis
Technical Working Groups

EURO-BIOIMAGING

Euro-BioImaging will run through 3 phases

2010-2013:	Preparatory Phase	(funded by EC)
2013-2017:	Construction Phase	(funded by Member States)
2017- :	Operation Phase	(funded by Member States)

EURO-BIOIMAGING

WP8 – Molecular Imaging

This WP aims to pave the way for implementing an integrated imaging infrastructure and imaging technologies for molecular imaging in model animals, where advanced light microscopy and medical imaging strongly complement each other. It will develop strategies **to provide access to multi-modal molecular imaging facilities** as well as to optical tomography and to repositories of fluorescent, radionuclide, MR-based and combined probes for *in vitro* and *in vivo* work.

Coordinators: S. Aime, A. Jacobs, J. Sharpe and C. Schultz.

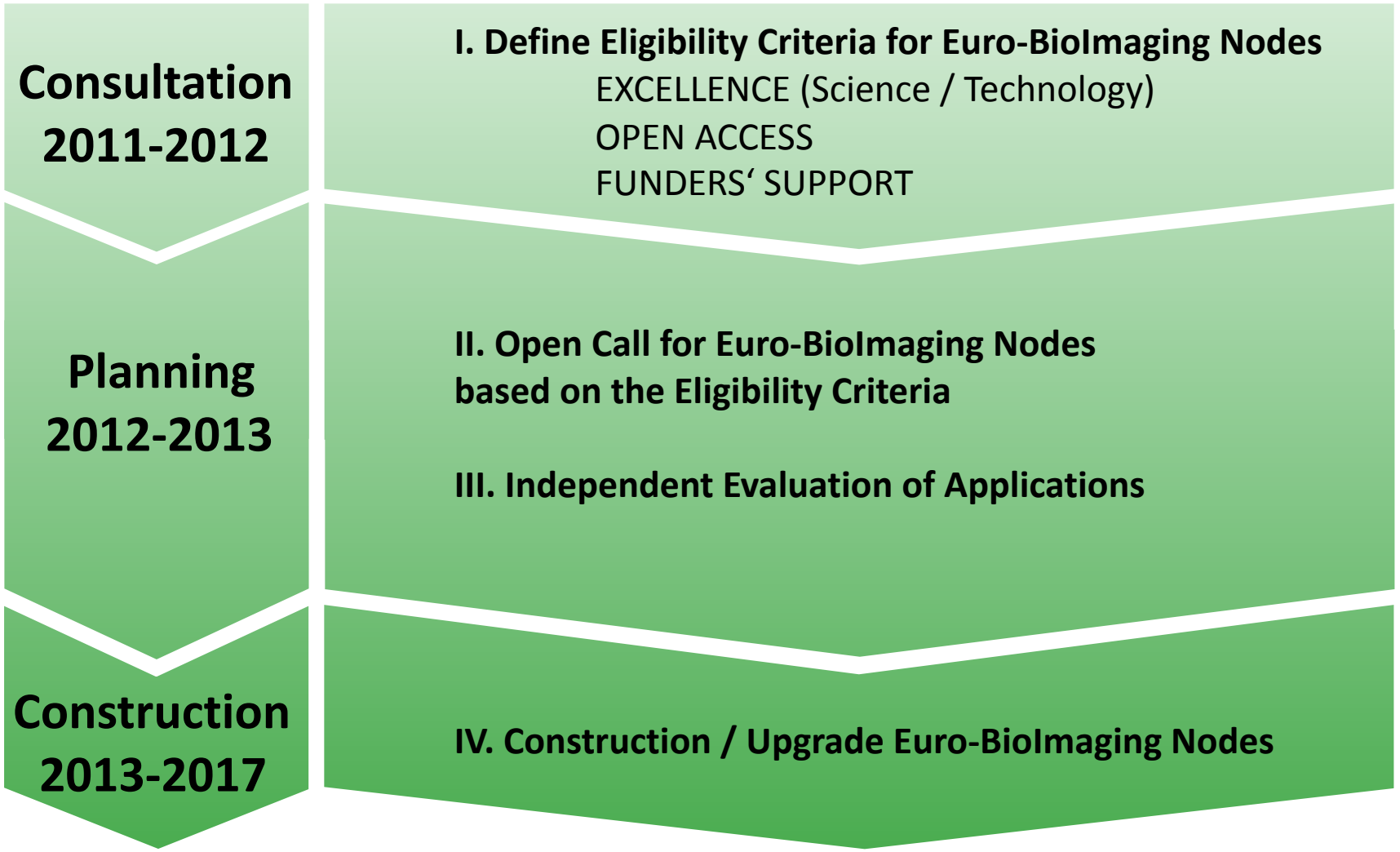
EURO-BIOIMAGING

- Many expressions of interest from Molecular Imaging Centers of several EU countries

- Some centers have already entered national roadmaps

A database with all contact information has been implemented and will be completed in the preparatory phase

Future Nodes



Define Eligibility Criteria

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.

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.

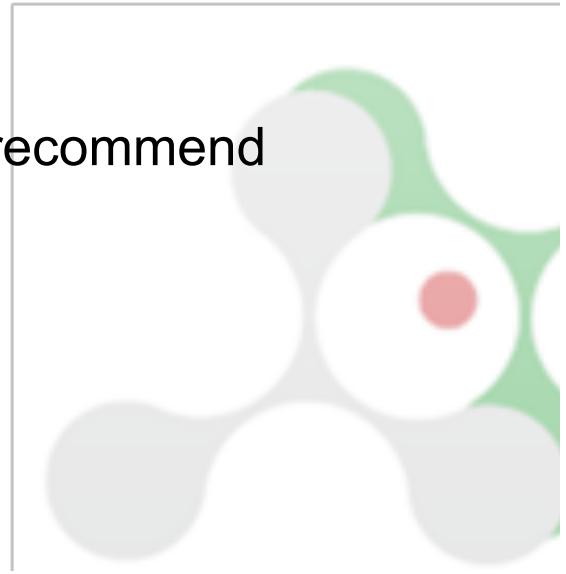
Planning phase 2012-2013

- Open call for nodes

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

- Independent evaluation

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



Construction phase 2013-2017

Construction / major upgrades of nodes

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.

Survey: 1st June until 17th of July 2011
http://www.eurobioimaging.eu/

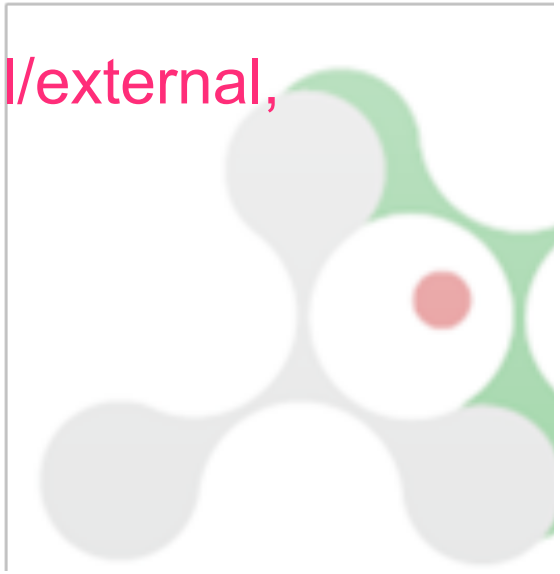
What level of infrastructure is most in need in the field of Molecular Imaging?

- Specialized nodes / Multi-center cluster(s) / Network of national centers…
- Common criteria for all Euro-BioImaging nodes will comprise scientific/technological excellence, open access for external users and support from funders.

- Surveys of existing European Centers, cluster and Networks
- Identify emerging techniques
- Analyze appropriateness/effectiveness of the proposed solutions

How could the access to the Molecular Imaging Infrastructure be designed?

- Identify the user needs
- Define rules for a standardized access (feasibility, scientific review…)
- Identify criteria for defining charges (internal/external, commercial, sustainability,…)
- Logistic support to visiting researchers
- …..



How could repositories for Imaging Probes be organized?

- Chemicals Probes
- Cellular and Animal models
- Repositories of preparative and characterization methods
- Rules to move Probes and Models across EBI associated laboratories
- IP issues