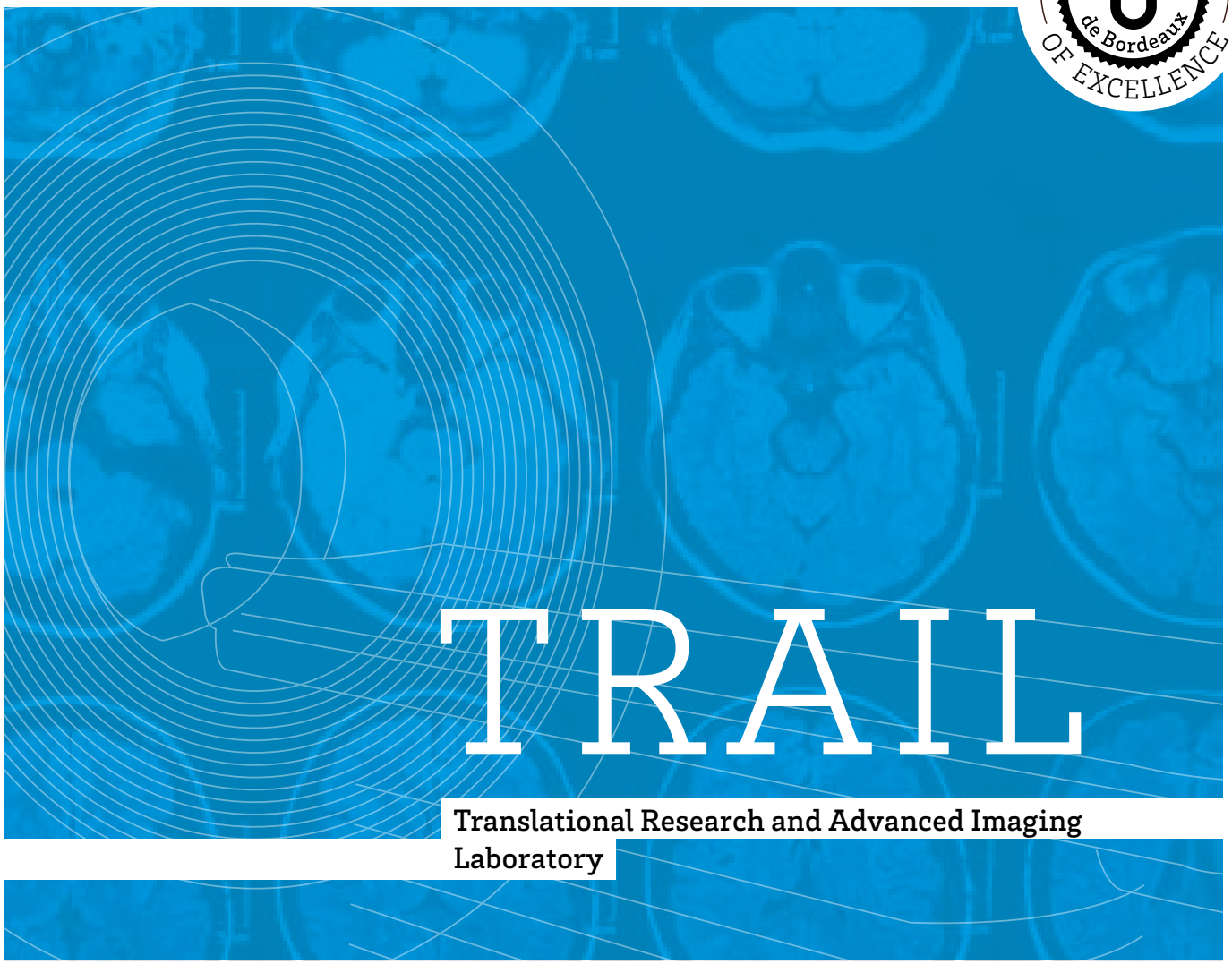
Activity report for Scientific Advisory Board



Translational Research and Advanced Imaging Laboratory

CLUSTER OF EXCELLENCE université de Bordeaux

INVESTISSEMENTS D'AVENIR

université de BORDEAUX

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› **AERES**
Evaluation Agency for Research and Higher Education (aeres-evaluation.com)

› **ANR**
National Research Agency (agence-nationale-recherche.fr)

› **ARSEP**
Multiple Sclerosis Research Foundation (arsep.org)

› **AST**
Regional technological transfer agency representing TRAIL trustees for intellectual property rights negotiations (ast-innovations.com)

› **BIPSA**
Bioimaging network in Aquitaine (http://www.rdv-routedeslasers.com/BIPSA/)

› **CEA**
French government-funded technological research organization (cea.fr)

› **CNRS**
The National Center for Scientific Research (cnrs.fr)

› **CPER**
State Region Plan Contract: the plan defines financial supports for a development strategy shared by the State and one Region

› **EQUIPEX**
Equipment of Excellence (idex.u-bordeaux.fr)

› **ESMRMB**
European Society for Magnetic Resonance in Medicine and Biology (esmrmb.org)

› **FENS-IBRO**
Federation of European Neuroscience Societies (fens.org)

› **FLI**
France Life Imaging: large-scale research infrastructure project (its.aviesan.fr)

› **IBIO**
Institute of Bioimaging

› **IDEX**
Initiative of Excellence (idex.u-bordeaux.fr)

› **INSERM**
National Institute for Health and Medical Research (inserm.fr)

› **INP**
Bordeaux Institute of Technology (ipb.fr)

› **ISHARE**
Cohort of students (i-share.fr)

› **ISMRM**
International Society for Magnetic Resonance in Medicine (ismrm.org)

› **ISPED**
Bordeaux School of Public Health (isped.u-bordeaux2.fr)

› **JFR**
French Radiology Congress organized by SFR (sfrnet.org)

› **LABEX**
Laboratory of Excellence (idex.u-bordeaux.fr)

› **LIRYC**
Institute of cardiac rhythm and modeling (ihu-liryc.fr)

› **MUSIC**
Multi-modality platform for specific imaging in cardiology (http://www.u-bordeaux.fr/Recherche/Investissements-d-avenir/Equipement-d-excellence-EquipEx)

› **PTIB**
Biomedical Innovation Technological Platform (ptib.u-bordeaux2.fr)

› **RSNA**
Radiological Society of North America (rsna.org)

› **SATT**
Technological Transfer Agency (satt.fr)

› **SFR**
French Society of Radiology (sfrnet.org)

› **TIC SANTE**
E-health cluster (cluster-tic-sante-aquitain.com)

› **TRL**
Technology Readiness Level (see definition from European Commission: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/annexes/h2020-wp1415-annex-g-trl_en.pdf)

› **U1045**
The Bordeaux Cardio-Thoracic Research Center (CRCTB, univ-bordeauxsegalen.fr)

› **U1049**
The "Neuroinflammation, Imaging and Therapy of Multiple Sclerosis" Inserm unit (inb.u-bordeaux2.fr)

› **U862**
The "Physiopathology of Neuronal Plasticity" Inserm unit (Magendie Institute, neurocentre-magendie.fr)

› **U869**
RNA, natural and artificial regulations (ARNA, canceropole-gso.org)

› **UMR5251**
The Bordeaux Institute of Mathematics (IMB, math.u-bordeaux.fr)

› **UMR5255**
The Institute of Molecular Sciences (ISM, ism.u-bordeaux1.fr)

› **UMR5287**
The Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, incia.u-bordeaux1.fr)

› **UMR5296**
The Neurofunctional Imaging Group (GIN, gin.cnrs.fr)

› **UMR5536**
The Centre for Magnetic Resonance of Biological Systems (RMSB, rmsb.u-bordeaux2.fr)

› **UMS3428**
Biomedical science imaging platform: imaging platform under supervision of the CNRS and the University of Bordeaux; regional node for the FLI network

› **WHO**
World Health Organization (who.int)

Activity report

This report refers to the 2011-2014 activity report sent to the French National Research Agency[1] in charge of the monitoring of LabEx programs.

[1] www.agence-nationale-recherche.fr/en/about-anr/investments-for-the-future/

1. Increasing imaging needs

TODAY, LABEX TRAIL HAS 23 COLLABORATIVE AND TRANSLATIONAL RESEARCH PROJECTS

a) Public health issues

Cancer, cardiovascular, respiratory and neurological diseases are major public health issues. According to the World Health Organization (WHO, annex 1), 17 million people die each year of cardiovascular disease (heart attacks, strokes), 8.2 million die of cancer (lung, colon, breast, stomach, liver), 6.2 million die from respiratory diseases (lower respiratory tract infections, chronic obstructive pulmonary disease), and 6.8 million die after suffering neurological disorders (Alzheimer, Parkinson, MS, neuroinfection). The aging of the population (27% over 65 years in Europe in 2040 versus 18% today) and the evolution of environmental factors go hand in hand with an increased risk of these diseases.

These public health risks and their economic impact - cost of medical care, work stoppage cost - are attracting the attention of public policymakers and will increase the need for prevention, diagnosis and personalized therapeutic monitoring.

Medical imaging plays a central role in meeting public health challenges. From a medical point of view, imaging provides an earlier, faster and more accurate diagnosis, as well as optimal therapeutic management adapted to the biology and genome of the patient. It also allows a more targeted drug delivery, better monitoring of the effectiveness of treatment and less invasive surgery because of the guidance it provides. From an economic point of view, imaging optimizes care costs thanks to early diagnosis, optimal treatment and a shorter recovery time. It is also a source of industrial competitiveness.

b) Translational Research

Effective transfer of the new knowledge, mechanisms, and techniques generated by advances in basic science research into new approaches for the prevention, diagnosis, and treatment of disease is essential for improving health.

The first step of translational research (T1) refers to the bench to bedside enterprise up to the first testing in humans: basic research in biology, bio-medicine, physics, mathematics, computer science, chemistry.

This step should ideally be followed by the transfer of results from clinical studies into everyday clinical practice and health decision making (T2): costs (global budget crisis), chronic diseases, aging, personalizing medicine, quality insurance, safety.

The development of imaging involves several areas of expertise (physics, chemistry, information technology, mathematics, biology, pre-clinical, clinical, medical,...) through a trans-disciplinary approach. Thus, imaging translational research aims at:

- Improving diagnosis by in vivo characterizing of cellular and molecular mechanisms (bio-markers in bio-imaging) in personalized medicine
- Monitoring treatments or target delivery of therapeutic agents and performing longitudinal evaluation of targeted therapies
- Developing image guided therapy: interventional radiology for surgery substitution, drug or gene delivery
- Developing surrogate marker for therapeutic trials
- Personalizing patient care
- Exploring large cohorts and populations to better understand diseases
- Attracting medical industries to create health, wealth and employment
- Transfering technology

c) "TRAIL, TRanslational Advanced Imaging Laboratory"

In this context of major public health issues and growing needs in medical imaging, research in Bordeaux offers 2 advantages: multidisciplinarity, which is specific to its community, and the co-involvement of teams around structuring projects.

In 2008, the medical imaging research teams in Bordeaux pooled their expertise in several fields and created the Institute of Bio-Imaging called "IBIO". For its development, the IBIO Institute received financial support from the 2007-2013 State-Region Project Contract[2] : a 4M€ subsidy for equipment and an 8M€ grant for a new building.

In 2011, the University centralized the management of its imaging research equipment on the CNRS-UMS-3428 technological platform. This platform includes 3 human/large animal MRI (0,2T; 3T; 3T), 3 small animal MRI (4,7T; 7,05T; 9,4T), 1PET-CT, 2 focused ultrasound systems and 6 optical systems.

In 2012, The Bordeaux site became the «regional node» for the «France Life Imaging[3] « national bio-imaging research infrastructure and received a proportionate share of funding to the tune of 3.7M€.

Meanwhile, the University of Bordeaux created an International Bioimaging Master's Program in 2011 (annex 2) in partnership with the University of Mons (Belgium) and Laval (Quebec). It had 15 students in 2013 and 10 in 2014.

In a context of globalization, the French government decided in 2009 to launch a «large loan» in order to raise funds for massive investments in research and innovation. This «investment program for the future[4]», with 47bn€, including 12bn€ for public research purposes, takes the form of calls for national proposals to select innovative projects with high growth potential. 7bn€ will be dedicated to financing «Initiatives of Excellence» (IdEx), which will create poles of higher education and research at international and multidisciplinary level. 1.9bn€ will fund the deployment of «Laboratories of Excellence» (LabEx) and 800M€ will be used for "Equipment of Excellence" (EquipEx).

The IBIO Bioimaging Institute - supported by the University of Bordeaux, the CNRS, the CEA, the INSERM, the University Hospital of Bordeaux and the Cancer Institute of Bordeaux - was a candidate in the first round of the «Laboratory of Excellence" program (LabEx) in 2010, and submitted the «TRAIL» project. Teams worked for a year to define a site project and enhance the areas of expertise of the community. The «TRAIL» project was awarded in July 2011. From all scientific fields, TRAIL ranked 57th out of 100 elected Laboratories of Excellence, and received funding of 9M€ for 9 years of development (2011-2019). «TRAIL» became the only medical imaging LabEx in France. It is part of the «investment programs for the future» portfolio of the University of Bordeaux and the «Initiatives of Excellence» program (IdEx Bordeaux) which was also awarded in 2011[5].

The group of founders of LabEx TRAIL consists in seven core partners; one partner left Bordeaux and 2 new partners entered the group in 2013, bringing to eight the number of units[6], which are A+/A only (AERES[7] 2011):

- The Institute of Molecular Sciences (ISM, UMR5255)
- The Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536)
- The Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045)
- The "Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862)
- The Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287)
- The Neurofunctional Imaging Group (GIN, UMR5296)
- The Bordeaux Institute of Mathematics (IMB, UMR5251)
- The "Neuroinflammation, imaging and therapy of multiple sclerosis" Inserm unit (U1049)

These research teams focus on six main objectives:

- Improving imaging science
- Developing translational research
- Evaluating medical and economic impacts
- Interacting with the industry
- Promoting training
- Establishing strong governance

They aim at developing a research portfolio that addresses major health themes:

- Neurology
- Oncology
- Cardiology
- Pulmonology
- Nephrology

Benefiting from the multidisciplinary approach in Bordeaux, seven work packages were proposed:

- Interventional imaging
- New imaging sequences
- Dynamic Nuclear Polarization
- Tracers and contrast agents
- Biological bio-imaging markers
- Mathematical simulation and modeling
- Cohort imaging methodology

Researchers have access to two state-of- the-art imaging platforms in Bordeaux:

- UMS-CNRS-3428: Biomedical science imaging platform (annex 4), University of Bordeaux, in association with the University Hospital Pellegrin
- PTIB: Biomedical Innovation Technological Platform[8], University of Bordeaux, in link association with the South University Hospital

[2] "CPER": http://www.aquitaine.pref.gouv.fr/Grands-dossiers/Le-contrat-de-projets-2007-2013

[3] its.aviesan.fr

[4] http://investissement-avenir.gouvernement.fr/content/action-projets/les-programmes/centres-dexcellence

[5] http://idex.u-bordeaux.fr/

[6] see annex 3 for web sites

[7] Evaluation Agency for Research and Higher Education (aeres-evaluation.com)

[8] ptib.u-bordeaux2.fr

2. 2011-2014 achievements

a) Governance

The governance of LabEx TRAIL is formalized by a Consortium Agreement signed by all five institutional trustees[9].

Board of Trustees:

- 5 members: University of Bordeaux, CNRS, INSERM, CEA, INP
- Role: the Board of Trustees oversees the development of the LabEx, checks the adequacy between objectives and strategy

Steering Committee:

- 14 members: 8 representatives of laboratories, 5 representatives of thematic axes and the Director, who chairs the committee (see annex 5 for members names)
- Role: members of the Steering Committee meet monthly to define the development strategy, collaborative actions, guidelines of calls for proposals, and to discuss the budget

Director/ANR coordinator:

- TRAIL Director is Pr Vincent Dousset; he is the "Coordinator" of the TRAIL program for the ANR
- Role: the Director is in charge of the development of the LabEx, the coordination of 8 core partners, and the collaboration with all partners; he liaises with the Board of Trustees and IdEx Bordeaux and does an annual reporting to the ANR, to IdEx Bordeaux (annex 6) and to the Board of Trustees when necessary

Evaluation Committee:

- 2 Members: 2 regional scientists independent from TRAIL
- Role: the Evaluation Committee evaluates scientific projects that were submitted to TRAIL calls and recommends projects to be granted on the basis of external scientific reviews

Administrative Staff:

- The administrative team is composed by the General Manager and the Scientific Animation Coordinator
- Role: the administrative team sets up procedures for calls for proposals, implements development actions, promotes the LabEx, organizes scientific animation, manages the budget in collaboration with the financial teams of the University of Bordeaux, and does the reporting to the Director, to the Steering Committee, to IdEx Bordeaux, and to the ANR under the supervision of TRAIL's Director

[9] University of Bordeaux, CNRS, INSERM, CEA, INP

b) Research projects

b.1) Internal call procedure

Research projects were selected through procedures for calls for proposals:

- Emerging calls support new projects looking to fund a proof of concept (18 months of funding, 35,000€ maximum)
- Federative calls concern advanced projects that are seeking to accelerate cross-sectional research (36 to 48 months of funding, 200,000€ maximum)
- Doctoral Fellowship calls and Postdoc calls allow the recruitment of a Doc/Postdoc to extend the development of an already awarded project (24 to 36 months of funding, 100,000€ maximum)
- Consolidation calls concern already granted projects that propose to broaden their research themes (70,000€ maximum)

The funding from TRAIL aims at financing human resources costs and running costs. Financial support for equipment is limited to 15,000€ per project.

For each emerging or federative research project, the proposal was analyzed by 2 international scientific reviewers[10] who assessed the scientific originality of the project, the quality of the team and the development plan. Their reviews were given to the Evaluation Committee, which recommended a selection of projects to the Director of TRAIL.

For Postdoc calls and Consolidation calls, the Steering Committee members selected the projects to be granted.

For the monitoring of the program, the project leader of each research project reported the achievements of his/her research as follows:

- An annual written report describing the scientific developments, recruitments, academic and industrial collaborations, publications, distinctions and awards, dissemination of knowledge, co-financing plans and budget
- An oral scientific presentation during the annual General Assembly

From 2011 to 2014, the LabEx organized 9 calls that funded 23 research projects for a total budget of 3,164M€[11] :

- In **2011**:
  5 federative projects, for a total budget of 494K€
- In **2012**:
  4 federative projects and 5 emerging projects for a total budget of 1151K€
- In **2013**:
  4 federative projects, 2 emerging projects and 2 PhD funding for a total budget of 894K€
- In **2014**:
  4 consolidated projects, 3 emerging projects and 3 PhD funding for a total budget of 625K€
-

[10] 48 reviewers: see annex 7 for names of organizations they belong to

[11] more detailed budgets in annex 8

	MRI guided HIFU	New sequences	DNP	Tracers & contrast agents	Biological Bio-imaging markers	Mathematic simulation and modeling	Cohort imaging methodology		
Neuro >		160 000 €	142 500 €		661 007 €		512 500 €	1 476 007 €	47%
Onco >	30 000 €		180 000 €	474 000 €	35 000 €	215 000 €		934 000 €	30%
Cardio >	140 000 €	250 000 €			195 000 €			585 000 €	18%
Pneumo >						35 000 €	134 448 €	169 448 €	5%
Nephro >								- €	0%
	170 000 €	410 000 €	322 500 €	474 000 €	891 007 €	250 000 €	646 948 €	**3 164 455 €**	100%
	5%	13%	10%	15%	28%	8%	20%	100%	

b.2) Selected research projects

By the end of 2014, the TRAIL research portfolio was composed of the following projects (see annex A for abstracts of projects):

ABACI:
Automated Brain anatomy softwares for cohort imaging, 2012, 415 000 € (neuro)

TRAIL&TRACKS:
Atlasing white matter tracts, 2011, 97 500 € (neuro)

COBRASCAN:
Quantitative computed tomography for phenotyping COPD within COBRA cohort, 2013, 134 448 € (pneumo)

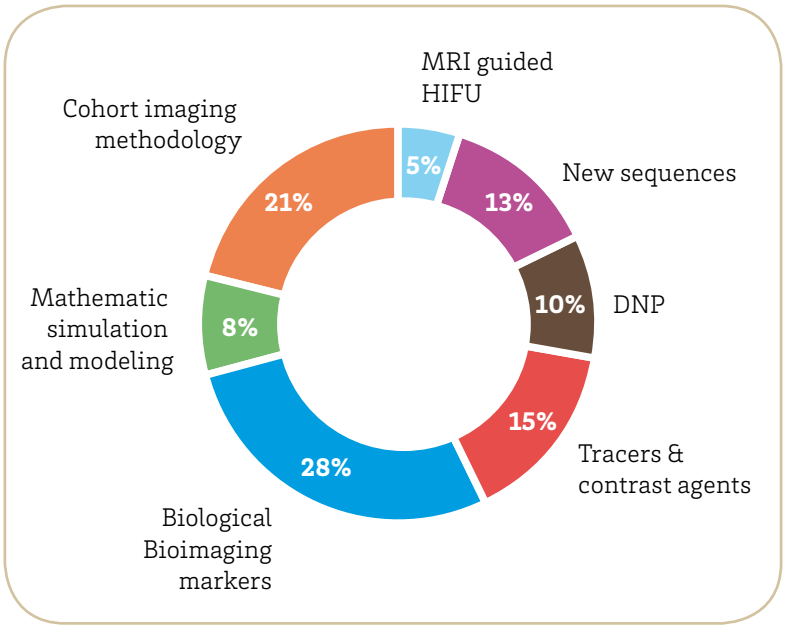
MOD:
Mathematical modeling of the response to antiangiogenic drugs via medical imaging, 2013, 180 000 € (onco)

CRYOIMMUNO:
Cryo immunotherapy of metastatic renal carcinoma, 2014, 35 000 € (onco)

NEKOMRI:
MRI sequence for bronchial wall segmentation and analysis, 2014, 35 000 € (pneumo)

HIFU:
Alteration of the blood brain barrier induced by HIFU, 2012, 30 000 € (onco)

MRGHIFU:
Methodological developments for applications of HIFU in cardiology and oncology, 2013, 140 000 € (cardio-onco)



ACTE:
Cognitive training and brain functional connectivity, 2012, 30 000 € (neuro)

HR-DTI:
Developping High-Resolution DTI method, 2012, 130 000 € (neuro)

NEWFISP:
Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases, 2012, 250 000 € (cardio-onco)

TRAILDNP:
To improve in vivo DNP in mice at 0.2T, 2011, 142 500 € (neuro)

ONCOFLUX:
Metabolic flux MR imaging in tumors, 2013, 180 000 € (onco)

IMMELAPT:
Detecting tumors using SPECT molecular imaging and optimized aptamers, 2012, 250 000 € (onco)

PRITOR:
NeuroPeptide Receptors Imaging for TumOR Targeting, 2013, 30 000 € (onco)

SUPSIFLU:
Supported Silyl Fluorination, 2013, 30 000 € (onco)

PIAF:
18F for PET-imaging angiogenesis, 2011, 164 000 € (onco)

BIOPSYPROSTAPROBE:
Antibody-based fluorescence probe for biopsy guidance of prostate cancer, 2014, 35 000 € (onco)

IBIO-NI:
New Imaging Biomarkers of neuroinflammation such as MS, 2012, 251 036 € (neuro)

INNES:
Lactate and neuronal metabolism, 2011, 149 971€ (neuro)

SCICOG&REACTIV:
Imaging biomarker in MS, 2011, 130 000 € (neuro)

TRANSFEAR:
Cerebral structure changes involved in pathological fear recovery, 2012, 130 000 € (neuro)

MIMATHUMAB:
Molecular Imaging of Atheroma with Human Antibody, 2012, 195 000 € (cardio)

b.3) Results at a glance[12]

Concerning the fields of research of the LabEx, TRAIL researchers have published 202 publications[13] in peer-reviewed journals since 2012 and they have given 150 scientific communications in national and international events:

- Publications: American Journal of Respiratory and Critical Care Medicine, Angewandte Chemie, Brain Structure and Function, European Journal of Nuclear Medicine and Molecular Imaging, Journal of Allergy and Clinical Immunology, Journal of the Alzheimer's Association, Nature, NeuroImage, Neurology, Neuron, Radiology, Science, ...(annex B)
- Scientific communications: ACTRIMS-ECTRIMS, EuroGlia, Gordon Conference, IEEE International Conference on Image Processing, International Symposium on therapeutic ultrasound, ISBI, ISMRM, MICCAI, Organization for Human Brain Mapping,... (annex B)

18 new collaborators and 8 trainees joined a community of about 170 people (annex 10):

- 3 postdoctoral fellowships (from France and Italy)
- 2 engineers
- 7 doctoral students (from Australia, Canada, France)
- 8 trainees
- 2 administrative staff for the operational management of the LabEx
- 4 visiting professors[14]

36 academic research collaborations have been established (annex 11):

- 21 international academic collaborations: Washington, Verona, Sherbrooke, Valencia, Bicams network, Magnims network, Amsterdam, New York, Royal Holloway London, Lausanne, Melbourne, Utah, Wisconsin, New Delhi, Ferrara, ...
- 12 national academic collaborations (Grenoble, Lyon, Marseille, Paris, Toulouse, Dijon...)

[12] See annex 9 for a comparison between TRAIL objectives and 2011-14 results

[13] 56 publications in journals which impact factor is superior to 5; 11 publications in journals which impact factor is superior to 10

[14] TRAIL teams were granted by IdEx program with 4 visiting professors who joined the LabEx for a short period (2-3 months): C Guttmann, Harvard; D Parker, University of Utah; AK Mishra, New Delhi; T Skrydstrup, University of Aarhus

15 manufacturers are involved in TRAIL research projects[15] :

- AFFICHEM: development of radiotracers
- BRUKER: sequence development and magnetic particle imaging
- CADESIS: database management for cohort imaging
- GLAXOSMITHKLINE: drug testing and validation of treatment for cancer diseases
- IBA MOLECULAR: development of radiotracers
- IGT SA: HIFU application development for cardiology and oncology
- INTRASENSE: post-processing software engineering
- LFB BIOTECHNOLOGIES : antibodies engineering
- MERKSERONO: neuroinflammation clinical studies
- NOVAPTECH: aptamer-based tools
- PHILIPS: technological support for high resolution MRI sequence development
- SANOFI: Alzheimer biomarkers
- SIEMENS: engineer time for oncology imaging
- TEVA: neuroinflammation clinical studies
- UNITHER PHARMA: development of an analgesic

A total of 6.2M€ of public and industrial co-funding reinforced TRAIL research projects (annex 12):

- 5.644M€ of public co-funding: ANR programs, ARSEP, French State, Doctoral School, European FP7 programs, INSERM, ISHARE,...
- 0.551M€ of industrial co-funding, not including technical and engineering support: IBA MOLECULAR, INTRASENSE, MERK SERONO, TEVA, UNITHER

b.4) Scientific results per work package

See annex C for main scientific results and orientations per work package

[15] If needed, AST - the technological transfer agency - represents the trustees (University of Bordeaux, CEA, CNRS, Inserm, INP) for intellectual property rights negotiations with industrials (ast-innovations.com)

c) Scientific animation

The LabEx TRAIL has organized 15 scientific events in Bordeaux (annex 13):

- 1 translational imaging meeting about "image guided therapy and diagnosis" welcoming 6 international speakers (50 participants)
- 8 translational imaging conferences between 2013 and 2014 (200 participants)
- 1 summer school, co-organized with the Neurofunctional Imaging Group: «Connectomics: the wiring diagram of the human brain», September 2014 (40 participants, annex 14)
- 2 seminars: «MRI contrast modulation» seminar (13 participants) in partnership with the University of Mons (Belgium); Neuro-Glia Interactions symposium (50 participants)
- 1 mentoring action: a twelve-month outgoing mobility at Stanford for 1 researcher working on MS imaging
- 2 knowledge dissemination actions: participation at the exhibition «CERVORAMA: Explore your brain and those of animals» in Cap Sciences, Bordeaux, in 2012 (62,000 visitors in 1 year), and a publication in the magazine «Chercheurs d'Aquitaine»

d) Snapshot of strengths and weaknesses by the end of 2014

d.1) Strengths for developing competitive research

Research themes	› TRAIL research projects concern major public health issues in neurology, cardiology, oncology, pneumology, and nephrology
Teams	› Multidisciplinarity on the same site: imaging, physics, biology, chemistry, mathematics, computer science › Collaboration between clinicians and researchers to develop targeted translational research › Large community of 170 people[16] › A+/A only teams (AERES 2011)
Equipment	› 2 up-to-date technological platforms supported by France Life Imaging national network › 2 dedicated buildings: IBIO (2014), IHU LIRYC (2015)
Budget	› A remaining budget of 5M€ for the 2015-2019 period

d.2) Strengths for unifying the community and widening visibility

Governance	› Consortium Agreement signed by all five institutional trustees[17] › Monthly meetings of the Steering Committee since 2011 › Two dedicated administrative staff
Supports	› IdEx Bordeaux support[18] : InterLabEx research program, thesis funding program, summer school co-financing, international visiting professor program, communication and management collaborations › Support from Conseil Régional d'Aquitaine: IBIO building and equipments co-funding

d.3) Weaknesses in developing competitive research

Research themes	› Competitive themes on international level › Scattered themes of research as result of multiple work packages and medical fields: 23 research projects financed
Equipment	› High investment and operating costs of imaging equipment

d.4) Weaknesses in unifying the community and widening visibility

External growth	› No national or international teams settling in Bordeaux › Weak regional and national industrial imaging scene › Limited technological transfer opportunities as projects show - so far - low Transfer Readiness Level

[16] 86 researchers, 17 postdocs, 25 engineers, 24 doctoral students, 8 technicians, 10 administrative staff

[17] University of Bordeaux, CNRS, INSERM, CEA, INP

[18] IdEx Bordeaux cofounded following research and education projects: LabEx TRAIL - LabEx CPU research program (134,000€), one thesis (49,000€), Connectomics summerschool (15,000€), 4 visiting professors

3. 2015-2019 strategy

a) Development strategy

The Steering Committee has decided to:

› **Strengthen already running research projects:**

- "Consolidation Program" dedicated to support already awarded research projects
- Co-funding of the renewal of a 3T research MRI by paying for MRI time

› **Develop external growth:**

- Building a network of international researchers on translational research
- Increased capacity of IBIO and IHU LIRYC: the IBIO building will enable the installation of 3 new MRI[19] and provide 750m^2 for welcoming new teams and spinoff companies; the new IHU LIRYC building will reinforce multidisciplinary research in cardiac pathologies (annex 15)
- Incentives for submitting to H2020 calls and for participating to LifeKic Consortium (annex 16)
- Incentives for creating a "IAL" (International Associated Laboratory)[20]
- Set up of an international host program
- Participation in the «visiting professor» program from IdEx Bordeaux
- Reinforcement of scientific dissemination: international speakers invited to Bordeaux, summer school "Imaging of neuroinflammation" (annex 17), scientific animation specific to each work package, etc

[19] Two small animals MRI and one 3T MRI

[20] Scientific collaboration between a TRAIL core partner and a foreign laboratory jointly working on a research project and sharing human resources and equipment

b) Provisional budget

Financial strategy has been set up as follows:

TRAIL OBJECTIVES	STRATEGY	PROGRAM	DECISION BOARD	2015-2019 BUDGET
WORKING ON MAJOR PUBLIC HEALTH ISSUES	Showing importance of TRAIL research to society and scientific community		Steering Committee	- €
DEVELOPING COMPETITIVE RESEARCH	Boosting existing research projects	Doctoral fellowship program	Steering Committee	400 000 €
		Post-doctoral fellowship program	Steering Committee	700 000 €
		Research projects consolidation program	Steering Committee	1 060 000 €
		Doctoral support program	Steering Committee	40 000 €
	Supporting new research projects	Federative and emerging research program	Steering Committee, Reviewers, Evaluation Committee	1 180 000 €
	Taking a strategical collective action	MRI time purchase program	Steering Committee	420 000 €
UNIFYING THE COMMUNITY AND STRENGTHENING INTERNATIONAL VISIBILITY	Multidisciplinarity of the community	Summerschool, training	Steering Committee	200 000 €
	Organizing the scientific animation	International speakers lectures and scientific events program	Steering Committee	45 000 €
	Administrating the cluster	Internal calls management, teams coordination, participating to Idex programs, promoting the cluster, reporting	Steering Committee, administrative teams	523 000 €
	Reinforcing attractiveness	International program (associate team, visiting scholars, mobility)	Steering Committee	450 000 €
		IdEx programs participation	Steering Committee	- €
			TOTAL	5 018 000 €

Annex A

Research Projects Abstracts

1/ Work package "MRI guided HIFU"

HIFU
High-Intensity Focused Ultrasound

Oncology

Klaus Petry, the "Neuroinflammation, imaging and therapy of multiple sclerosis" Inserm unit U1049, 2012

TRAIL funding: 30 000 €

Passage of the blood brain barrier (BBB) is essential for effective drug delivery into the central nervous system. High-Intensity Focused Ultrasound (HIFU) has shown promising for non-invasive and focal opening of the BBB. Very limited, however, is the understanding of the underlying cellular and molecular mechanisms at the BBB, in particular of the endothelial cells being involved in such HIFU induced opening and eventually induced unwanted side effects. By in vitro studies of the BBB model (hCMEC/D3 cell line) under HIFU we will investigate the cellular and molecular dependent transports (clathrin, caveolin, tight junctions) and their specific inhibitions. In vivo studies of focally HIFU induced BBB alteration and histopathological evaluation and molecular expression studies of endothelial cells will validate the defined activated cellular and molecular transports. Histopathological studies will evaluate eventual non desired side effects of BBB opening and in adjacent CNS parenchyma due to the focal HIFU application. A portable HIFU system in application to small cell cultures and in vivo studies has been locally developed in partnership with Image Guided Therapy SA (Pessac, France) and in collaboration with TRAIL

MRGHIFU
Methodological developments for preclinical and clinical applications of MR guided HIFU

Oncology-cardiology

Bruno Quesson, the Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045), 2013

TRAIL funding: 140 000 €

The possibility to locally deposit thermal and mechanical energy in a non-invasive way with focused ultrasound (High Intensity Focused Ultrasound - HIFU) has opened new possibilities for the development of innovative therapies with improved reliability and reduced associated trauma (Ter Haar et al, 2012). In the last decade, real-time imaging (ultrasound (US) and Magnetic Resonance (MR)) methods have been developed to characterize ultrasound propagation in living tissues and to measure and control the local heat deposition. The aim of the present project is to develop new methods for MR guided HIFU by exploiting the hardware platform installed in Bordeaux. This project builds on the deep knowledge in real time guidance of MR guided HIFU effects to reinforce fundamental research in cardiology and oncology and to facilitate translation toward clinical application. This proposal associates several academic teams (INSERM, CNRS) in Physics and Biology, clinicians (Anti Cancer Center Bergonié), one international collaborative team (Univ. Salt lake City) and receives the support of a local company specialized in MR guided HIFU instrumentation and methods (Image Guided Therapy SA).

The project is structured in four work packages, including methodological developments of MR monitoring methods (WP 1), new HIFU sonication strategies (WP 2), in vivo characterization on small animal models of the interaction between HIFU and biological tissues (WP 3) and preclinical evaluation and optimization of a dedicated breast MRgHIFU platform (WP 4). This project receives important co-financing and requests funding for additional human resources. The objective is to improve the synergy between the different scientific objectives of the research community (fundamental research, cardiology and oncology) and should benefit to other research teams for future applications. The direct implication of a local company (IGT SA) reinforces the immediate collaboration between each research team and aims to facilitate technological transfer and emergence of new products and applications (each site being equipped with similar MRI scanners (Siemens) and all HIFU devices being designed by IGT SA), with the aim to shorten the time scale between technical advances, fundamental research and clinical applications.

2/ Work package "NEW SEQUENCES"

ACTE
Ambulatory cognitive training in elderly: Relation with intrinsic brain functional connectivity

Neurology

Sandra Chanraud, the Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287), 2012

TRAIL funding: 30 000 €

Age-related cognitive decline has multiple brain substrates including compromised integrity of cortical gray matter nodes, white matter connections, and cerebrovascular perfusion. Successful aging involves functional neuroadaptation to accommodate to or compensate for these multi-level changes in brain microstructure and macrostructure and the potential to enhance function with redistribution of resources. Cognitive training from computerized tools holds promise for improving cognitive abilities in cognitively normal, community-dwelling older adults who have a higher risk of cognitive decline, due to a low "cognitive reserve" as they age. Even though benefits on psychological measures of training in elderly have been well documented, little is known on neural substrates underlying this cognitive gain. It is known, however, that frontostriatocerebellar networks underlie changes from controlled to automatic behaviors involved in learning processes launched during task training. Also, functional connectivity of the "default-mode" network (DMN), which is specific to the resting brain, has been revealed to predict task performance after training. Therefore, we propose to identify, in elderly neurophysiological substrates of training-induced plasticity using resting-state connectivity, and functional activation measures together with measures of cognitive efficiency induced via tasks training, using ambulatory and computerized techniques. These studies will be directed by three overarching hypotheses: 1) training processes will help subjects to establish automatic processes through changes of resting functional connectivity 2) the extent of training-related changes from controlled to automatic processes will be related to functional connectivity changes within and between specific neural networks, i.e., frontostriatocerebellar and defaultmode networks 3) greater anticorrelation between task- and rest- networks will correlate with greater local functional connectivity and better performance.

HRDTI
High Resolution DTI method

Neurology

Bassem Hiba, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2012

TRAIL funding: 130 000 €

Despite its clinical strength, Diffusion Tensor Imaging (DTI) inherently suffers from a limited signal to noise ratio which leads to a low spatial resolution. The limited resolution (2-3 mm) of DTI introduces large partial volume effects which could limit the accuracy of diffusion parameter assessment for small structures of brain (cortical gray matter and small tracks of white matter) and mask changes of diffusion parameters in small pathological lesions. We have developed a high resolution (HR) DTI strategy, based on an optimal acquisition method and on new denoising and interpolation post-processing algorithms. This very promising approach has provided HRDTI data with a submillimeter isotropic resolution (0.4 mm). The aim of this proposal is to optimize the acquisition and post-processing methods and to validate our HR-DTI approach at 3T.

NEWFISP
Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases

Cardiology

Sylvain Miraux, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2012

TRAIL funding: 250 000 €

The goal of this project is: 1) to define the methods to perform MR images with high space and time resolutions, that would provide more quantitative data and thus more information at a local and at a whole-body level, and more adapted to patient imaging. 2) in the short and medium term, and in interaction with the IHU teams, to transfer the breakthrough developed by the RMSB cardio-vascular imaging team from small-animal to human, in order to correctly diagnose cardiac pathologies and accurately guide the therapies. 3) in medium and long term, and in interaction with the oncologists at Bergonie Institute, to develop original approaches to early diagnose metastases by MRI. This project is based on the development and improvement of the MR (b)SSFP sequence (fully balanced Steady State Free Precession). This sequence is already performed on an everyday basis at high magnetic field (4.7T, 7T and 9.4T) at the RMSB. This sequence was also adapted and optimized at clinical field (1.5T and 3T) by one of the co-author of this project. The strength of the development and optimization would allow the use of this sequence on small animals for preclinical studies on pathological models, and also on human to apply this sequence in clinical setting.

3/ Work package "DNP"

TRAILDNP
In vivo DNP in mice at 0,2T

Neurology

Eric Thiaudiere, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2011

TRAIL funding: 142 500 €

The UMR 5536 is nowadays developing an unique double resonance modality, using electron spin resonance for enhancing MRI signal by dynamic polarization. This modality is now running in living mice, with clear contrast enhancement brought by the addition of nitroxides. By the same way, brain tumor locations was revealed by passive retention of free radicals at the tumor site. The proposal aims at hiring a PhD student for improving the method in order to provide high spatial and time resolutions. The work will consist in sequence developments, experiencing animal models and, if possible, hardware developments. The ultimate goal is to perform in vivo DNP-MRI to reveal disease-induced protease activity with chemically designed nitroxides provided by partners.

ONCOFLUX
Metabolic flux MR imaging in tumors

Oncology

Yannick Cremillieux, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2013

TRAIL funding: 180 000 €

Most tumor cells are characterized by abnormal metabolic pathways to generate energy (as exemplified in the well-known Warburg effect) and to sustain enhanced cell proliferation. This disturbed metabolism is a key hallmark of tumor cell aggressiveness and as a result of prognostic in patients. Importantly, the cancer cell metabolism can vary in time and be highly heterogeneous in a given tumor. Until recently, no single imaging technique was able to provide non-invasive measurements of metabolic fluxes with sufficient spatial resolution and sensitivity. However in the last decade, a new MR imaging tool based on hyperpolarization of C13-labelled metabolites has emerged as a highly sensitive non-invasive metabolic imaging technique. The UMR 5536 is equipped with a unique DNP (Dynamic Nuclear Polarization) apparatus able to dramatically enhance (5 orders of magnitude) the sensitivity of detection of hyperpolarized metabolized substrates with MRI.

The research program ONCOFLUX will aim at the detection and grading of malignant tumors in brain and lungs in animal models, and will focus on the investigation and quantification of the metabolic fluxes in vivo in these tumors. Besides, this research program will establish standardized hyperpolarization procedures and MRS/MRI protocols for in vivo metabolism investigation in cardiac, kidneys or brain applications.

4/ Work package "TRACERS AND CONSTRAST AGENTS"

IMMELAPT
SPECT molecular Imaging and optimized apatmers for tumor detection

Oncology

Jean-Jacques Toulme, the Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287), 2012

TRAIL funding: 250 000 €

The ImMelApt project takes advantage of the potential of aptamers for recognizing a target of interest and aims at bringing an innovative answer to the need for imaging tumors in vivo. Starting from an aptamer we previously raised against the human MMP-9 -a protein that is overexpressed in tumors and is capable of degrading extra cellular matrix components, thus permitting cancer cell migration- we will i) synthesize and characterize several derivatives of this aptamer, ii) convert them into imaging probes, with different modalities, iii) image human melanomas ex vivo and iv) undertake in vivo experiments in animal model. The perspective of this project is the design of tools for detecting and monitoring human tumors, using SPECT molecular imaging

PRITOR
NeuroPeptide Receptors Imaging for TumOR Targeting

Oncology

Elif Hindie, the Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287), 2013

TRAIL funding: 30 000 €

Receptors of some regulatory peptides can be highly expressed in various human tumors, thus offering the opportunity of a specific molecular imaging with radiolabeled peptides. Advantageous pharmacological and pharmacokinetic properties as well as easy radiolabeling procedures make peptides attractive molecular tools for molecular imaging over antibodies and theirs derivates. The success encountered with the use of radiolabeled somatostatin analogs for imaging and targeted therapy of endocrine tumors that express somatostatin receptors is probably the first of a long list since multiple receptors are now recognized as potential targets.

This project will first compare the density and distribution of several neuropeptide receptors in human breast cancer in order to identify which one could be considered as the molecular target of highest interest.

The second part of the present molecular imaging project will consist in the pre-clinical evaluation of a [68Ga]-radiolabeled neuropeptide analog. Some analogs have already been synthesized by our teams

SUPSIFLU
Supported Silyl Fluorination

Oncology

Philippe Hermange, the Institute of Molecular Sciences (ISM, UMR5255), 2013

TRAIL funding: 30 000 €

Positron Emission Tomography (PET) has become a powerful tool for medical diagnostic over the last decade, as illustrated by the extensive use of 2-desoxy-2-[18F]-fluoro-D-glucose for tumor imaging. However, fast and efficient last-step labeling by short-lived radionuclides still remains a challenging task with biomolecule based tracers. Indeed, they require smooth reaction conditions and optimized purification steps to obtain high radiochemical yield and purity. Developing new methodologies to overcome these issues, our team has been successfully able to label peptides and oligonucleotides for in vivo trials using nucleophilic fluorination of a silicon-based building block. As part of the TRAIL work package 4, our efforts are now focused on making this methodology adaptable to a simple automatized process. For example, pre-packed cartridges of the desired tracer would definitively allow a wider use of this labeling strategy for pre-clinical research by avoiding chromatography in purification steps. In this context, solid-phase supported tracers with a selective fluoride-triggered release could be perfect candidates. Despite these attracting advantages, no results on such tracers were reported to date, probably due to a lower reactivity of the very bulky di-tert-butylphenyl-silyl when is linked to a solid support. To overcome this effect, this emerging project proposes a positively charged leaving group (i.e. an imidazolium) that will facilitate the fluoride approach by salt metathesis. This moiety will be associated to the solid support and will ensure the selective release of fluorinated molecules (Scheme). Preliminarily studies with a non-supported model compound have validated the concept in term of synthetic feasibility and reactivity towards fluoride. Thus, further experiments are needed to optimize conditions in the case of a real biomolecule and to develop the promising supported version for 18F fluorination

PIAF
PET Imaging of Angiogenesis by 18F-RGD

Oncology

Eric Fouquet, the Institute of Molecular Sciences (ISM, UMR5255), 2011

TRAIL funding: 164 000€

The project will firstly establish the interest of the **αvβ3** integrin imaging by PET imaging, by conceiving and achieving the synthesis of an original 18F-RGD radiotracer, then experimenting it on a murine tumoral model of melanoma. Secondly, in a perspective of « proof of concept », our molecular imaging project will consist in the validation of the 18F-RGD as a marker of the biological effect induced by therapies, inhibiting neoangiogenesis such as Dendrogenin A (a new and promising anti-tumoral recently discovered). A further objective will be to complete the pre-clinical evaluation of the molecule to bring it up to the clinical state and assess in situ its impact on the tumoral neovascularisation in order to select

5/ Work package "BIOLOGICAL BIOIMAGING MARKERS"

IBIONI
Imaging Biomarkers of experimental and clinical neuroinflammation

Neurology

Bruno Brochet, the "Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862), 2012

TRAIL funding: 251 036 €

This translational scientific project associates different neuroimaging, neuroepidemiological and neuroscience teams to study mechanisms and consequences of neuroinflammation using new imaging biomarkers in experimental models and human diseases, such as multiple sclerosis (MS). We will study (1) lateral diffusion along the astrocyte membrane of AQP4 in live cells using quantum dot imaging; (2) Validation of new biomarkers for tissue integrity characterisation in experimental models of MS using new high-sensitivity Diffusion Tenser Imaging (DTI), MR Diffusion kurtosis Imaging (DKI) and Diffusion Spectrum Imaging (DSI); (3) application of DTI, fMRI and Voxel based morphometry (VBM) to study the mechanisms of cognitive impairment in MS; (4) application of MRI markers in large cohorts of MS patients (OFSEP) and controls (I-Share).

INNES
Investigation on Neuronal Energetic Substrate

Neurology

Anne-Karine Bouzier-Sore, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2011

TRAIL funding: 149 971 €

Glucose is considered as the main brain energy substrate. However, increasing evidence now suggest that lactate, coming from astrocytes, could be a supplementary and very efficiency energetic fuel for neurons, especially during brain activation as well as during hypoxia. The aim of this project will be to characterize the role of lactate as a substrate for neurons during brain activation. Both ex vivo and in vivo situations will be studied. Originality of the ex vivo experiments is to directly analyze metabolism on brain biopsies using Nuclear Magnetic Resonance (NMR) at High Resolution at the Magic Angle Spinning (HR-MAS) spectroscopy after perfusion of 13C-labeled substrates in awake rats. Resting as well as activated conditions (unilateral stimulation of the whisker-to-barrel pathway) will be compared. To model brain metabolism, 13C-labeled glucose and lactate will be infused to animals during 1h, to reach the isotopic steady state. To determine whether MCT2 (neuronal monocarboxylate transporter) is involved in the transfer of astrocytic lactate to neurons, the same experimental procedure will be performed in rats in which MCT2 will be silenced using lentiviral approach. In vivo experiments will be also designed to follow in real-time brain lactate by localized NMR spectroscopy and molecular imaging of lactate at 7T also during whisker stimulation. Finally, we will investigate the implication of such a lactate shuttle between astrocytes and neurons and will perform experiments on neonate model of brain hypoxia to study whether lactate administration directly after hypoxia could be neuroprotective and therefore used as a therapeutic tool.

SCICOG&REACTIV
Bio-imaging markers of tissue integrity, predictors of cognitive impairment in inflammatory demyelinating diseases

Neurology

Bruno Brochet, the "Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862), 2011

TRAIL funding: 130 000 €

Multiple Sclerosis (MS) is the main non-traumatic cause of neurological disability in young adults. There is growing evidence that the clinical disability in MS is not only due to motor deficiencies but also to cognitive deficiencies. Cognitive deficiencies could occur at the early stages of MS (high-risk clinicallyisolated syndromes (CIS) and early MS) and concern mainly information processing speed (IPS) and memory. Recent works suggested that cognitive deficiencies correlate with MRI parameters reflecting diffuse alteration in brain white matter leading to disconnection between cortical areas but also with atrophy of the brain gray matter. The aim of this project is to determine which MRI parameters could be use as a biomarker to predict cognitive deficiencies in CIS and which MRI parameters could predict the responsiveness of MS patients to cognitive rehabilitation. Two parameters will be studied, fractional anisotropy in brain normal-appearing white matter using diffusion-tensor-imaging and volumetric change in brain gray matter using Voxel-Based Morphometry. This project is based on two clinical studies, the SCI-COG, a one-year longitudinal study of CIS patients starting early 2012 and the REACTIV study, an on-going controlled trial of cognitive rehabilitation in MS. This is a 36 months project. Both studies received funding from industrial partners and ARSEP but this application concerns the need for additional human resource (study engineer) to complete image analysis

TRANSFEAR
Translational study of the cerebral substrates involved in pathological fear recovery

Neurology

Melissa Bonnet, the "Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862), 2012

TRAIL funding: 130 000 €

Anxiety Disorders including post-traumatic stress disorders (PTSD) are the most common mental disorders with an estimated lifetime prevalence of 15% -20% in the general population. They occur early in life and are risk factors for other mental disorders later in life such as affective disorders and substance abuse disorders thus presenting a major health problem in industrialized countries (WHO and WONCA 2008). In recent years, it has become evident that associative learning mechanisms and alteration in sleep architecture play a crucial role in relapse of fear behaviors. Indeed, it is known that exposure to stimuli that have been repeatedly associated with traumatic events can precipitate fear behavior during relapse and that the lack of extinction consolidation during post-extinction sleep correlates with high fear recovery. While tremendous progress has been made in identifying the basic mechanisms underlying acquisition of fear and consolidation of extinction, much less is known about the neuronal mechanisms involved in fear relapse after extinction. The present translational proposal aims at identifying the changes in functional connectivity of cerebral structures involved in relapse of fear behavior using innovative technologies in both animal and humans. Firstly, we will develop and validate a fear conditioning and extinction protocol in healthy humans, which shares similarities with that currently used in rodents, in order to provide a strong physiological background on fear extinction mechanisms in healthy context. Secondly, we will study the changes in functional interactions between neuronal structures involved in fear and extinction learning during fear behavior using electrophysiological recordings in rodents and functional Magnetic Resonance Imaging (fMRI) technique in humans. Finally we will assess sleep modifications in rodents and healthy humans by using neuronal recordings and electroencephalography (EEG), respectively. The proposed studies will reveal how the functional organization of specific neural structures directly modulates relapse of fear behavior using relevant animal and human models. Elucidating the neural mechanisms mediating pathological fear recovery should further suggest novel therapeutic strategies for psychiatric conditions characterized by a high propensity to relapse such as PTSD.

BIOPSYPROSTAPROBE
Antibody-based fluorescence probe for biopsy guidance of prostate cancer

Oncology

Franck Couillaud, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2014

TRAIL funding: 35 000 €

Prostatic carcinoma is the most common cancer affecting one in six and is a leading cause of cancer mortality. Cancer detection include imaging and tumor biomarker dosage like PSA (prostate-specific antigen), but actually all of examinations cannot diagnose prostate cancer at an early stage with sufficient confidence. Therefore a tumor biopsy is required to confirm the presence of the tumor, its size and its grade. Because these biopsies are negative in around 60% of cases, new methods for biopsy guidance are required. As member of the The BiTum consortium, we have proposed to combine fluorescence imaging to the ultrasound imaging currently used in clinic, in order to detect small prostate tumors making possible to guide the transrectal biopsy . The goal of the current project is to develop a fluorescescent probe based on a labeled antibody. We have selected a ScFv fragment of the monoclonal D2B anti-PSMA antibody, provided by our Italians collaborators to be labeled with a near infrared fluorophore. This fragment is known to specifically targeted in vivo subcutaneous tumor in mice. The test probe efficiency in physiopathological context as close as possible of clinical conditions, we are proposing to develop a prostate cancer model using mouse RM1 cells in immunocompetent mice. RM1 cells will be genetically modified to express both human PSMA and imaging reporter genes in order to test labeling specificity. Completion of the current project will open avenue for translational application of ScFv fragment for biopsy guidance of prostate cancer. That's why this innovative way of the project has appeared in directly coupling the scFvD2B fragment to a near infrared fluorophore

MIMATHUMAB
Molecular IMaging of ATHeroma with HUMan AntiBody

Cardiology

Gisèle Clofent-Sanchez, the Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536), 2012

TRAIL funding: 195 000 €

MIMATHUMAB project focuses on molecular imaging of atherosclerosis, using human antibody discovery for high quality functionalization of nanoparticles dedicated to safe and non-invasive magnetic resonance imaging (MRI) and for radiolabeling with 18F for positron emission tomography (PET). This translational project at the crossroads of WP5 and cardiology domain is part of a wider interdisciplinary research aimed at developing a theranostic approach for atherosclerosis. Atherosclerotic lesions (atheroma), the leading cause of the majority of cardiovascular

disorders, are asymmetric focal thickenings of the innermost layer of the artery, the intima. They consist of cells, connective-tissue elements, lipids and debris. Atherosclerosis is a disease involving endothelial dysfunction, oxidative stress, immunity, inflammation and calcification. The inflammatory lesions evolve to vulnerable plaques at high risk of rupture and thrombi formation, thus precipitating the clinical conditions of stroke and myocardial infarction, the main causes of death in the Western world. The goals for the years to come must include translation of the experimental work to the visualization of appealing biologic targets in humans. Nowadays, there is an increasing interest in molecular imaging of atherosclerosis, in order to assess the cellular components that underlie the risk of rupture. Molecular imaging requires highly sensitive and specific probes made of a signal detection compound and an affinity ligand for targeting. In this project, we aimed to achieve molecular imaging by functionalizing imaging devices with recombinant human single chain Fv (scFv) antibodies (Abs) designed to target vulnerable plaques developed in atherosclerosis. MIMATHUMAB differs from international competition as it offers human antibodies (Abs) targeting relevant biomarkers to functionalize multimodal nanoparticles. Our team has the know-how for in vivo selection of human Abs in animal models of atherosclerosis. This emerging project is initiated with an international team also deeply involved in atherosclerosis and antibody research for use in human beings. In order to implement a new strategy to diagnose atherosclerosis by MRI, we also need strong contrast agents. We therefore come closer to UPR9048 CNRS (Institut de Chimie de la Matière Condensée de Bordeaux, groupe 5 « Chimie des nanomatériaux ») which has recently developed a platform of superparamagnetic nanoparticles, the VUSPIO (Versatile Ultrasmall SuperParamagnetic Iron Oxide) platform that can accommodate targeting ligands such as chimeric or fusion proteins, peptides or antibodies. The project offers the unique opportunity to develop recombinant strategies and agents starting from the initial design up to the final in vivo evaluation. Owing to its multidisciplinary competences, this project takes on special importance within TRAIL, which leans by definition on translational and multidisciplinary approaches.

6/ Work package "MATHEMATIC SIMULATION AND MODELING"

MOD: Mathematical modeling of the response to antiangiogenic drugs via medical imaging

Oncology

Thierry Colin, the Bordeaux Institute of Mathematics (IMB, UMR5251), 2013

TRAIL funding: 180 000 €

The aim of this project is to propose mathematical models for evaluating the response to anti-angiogenic drugs using functional imaging. The ultimate goal of this approach will be to be able to propose numerical tools in order to predict the evolution of the growth of a tumor or its long-term response to a treatment using the early response, measured through functional imaging.

The methodology will be the following one: we start by writing a mathematical model (using a set of partial differential equations) that relies on a mechanistical description of the tumor growth. Usually, this model will involve a set of "free" parameters (less than 10) that are unknown and to be determined. Then we check that this model is able to describe, at least qualitatively, the behaviors that are observed on longitudinal series of CT-scans or MRI. At this point two strategies are available: 1/ The first one consists in trying to describe the characteristics of the image (as for example the texture of the image of the tumor) through the model in order to explain the effect of the drugs. For example, it is well known that the effect of anti-angiogenic drugs may not only be observed on the change of shape of the tumor but also on its constitution. Using series of longitudinal data, we will try to highlight new numerical markers evaluating the long-term response to the therapy. 2/ The second approach will be to provide patient-specific prognosis: we try to find the «best» values of the parameters that allow to match with the series of imaged by solving an optimization problem; then me make a prediction using this set of parameters. This strategy has been successfully used for evaluating the aggressiveness of lung metastases without treatment in the team MC2 of T. Colin. We will develop this methodology in two directions. The first axis is devoted to NSCLC and brain metastasis and the second one to kidney cancers and lung metastasis. We will develop below the specificity in terms of imaging of both axes.

Axis 1: Modeling the response of NSCLC to Avastin

We plan to use diffusion MRIs in order to parametrize the model as well as the new sequences developed in the team of S. Miraux. This study will rely on a clinical trial in Bergonié (J. Palussière). Experiences on the small animal will be provided by the team of A. Bikfalvi. The modeling part will be done in the team of T. Colin.

The RMSB team led by S. Miraux has the expertise in 3D small animal MR imaging for the detection of small brain metastases in vivo, without requiring the use of any contrast agent. These methods allow for longitudinal studies and tumor volume quantifications in order to get the information necessary to develop a predicting model of tumor growth. However, imaging lungs, in small animals as well as in humans, remains a challenge in MRI due to its really low SNR, respiratory motion and susceptibility artifacts generated by the air-tissue interface.

For this purpose, novel radial MR sequences (Gradient echo or trueFISP) will be performed and optimized in order to obtain high contrast between metastases and healthy lungs without any artifacts on the MR images.

This optimization will be performed on a 7T pre-clinical scanner for small animal (RMSB) and in parallel on a 1.5T clinical scanner at Bergonié Institute (in collaboration with Siemens).

For the pre-clinical study, a well-known model of brain metastasis using human breast cancer cells will be used to validate the optimization of the MR sequences. These data will have to be accurate enough for computer scientists to establish a mathematical model predicting the metastases growth in the mouse brain.

In a second step, to get closer to the clinical practice, renal tumor cells will be orthotopically injected into mice inducing pulmonary metastasis (INSERM U 1029). The MR sequence optimization followed by the mathematical model will be tested and compared with brain metastases.

For clinical studies, patients developing pulmonary metastasis will be selected and longitudinally imaged using the optimized sequences (Bergonié).

Axis 2: Modeling the response of renal cell carcinomas (RCC) to anti-angiogenic drugs

The strategy will be similar to axis one and concerns RCC with or without metastases to other organs (pancreas, lung). Based on the key step of hypoxia, which promotes cancer development, we will integrate parameters obtained from several imaging techniques in order to improve the accuracy of the model.

The first step will be to obtain test data from specific MR sequences, such as Dynamic Contrast Enhanced or BOLD sequences, provided by the 3T clinical MRI of Pellegrin Hospital (F. Cornelis, N. Grenier) with the technical support of General Electrics (B. Perez). All these imaging techniques are currently developed and added to the morphologic MR evaluation performed during clinical studies on RCC directed by A. Ravaud (St André Hospital).

New algorithms of real time adaptive distortion correction (B De Senneville) will be progressively integrated in these MR acquisitions. The second step will be to integrate data obtained from specific radioactive markers for TEP scan (P. Fernandez, H. de Clermont) focus on hypoxia such as F miso.

CRYOIMMUNO
Cryo immunotherapy of metastatic renal carcinoma

Oncology

François Cornelis, the Bordeaux Institute of Mathematics (IMB, UMR5251), 2014

TRAIL funding: 35 000 €

An improved understanding of renal cell carcinoma (RCC) tumour biology has resulted in major advances in the treatment of patients with metastatic RCC (mRCC). Novel strategies that combine a cytoreductive modality (i.e. intra-tumoral destruction, by percutaneous image-guided cryoablation in our case) with immune-modulation, obtained by the adjunction of more and less specific drugs, are promising strategies for the management of tumors. Such approach is currently a wide field of development in oncology and immunology; and has promising preclinical results. However, at this time, no clinical study has been conducted in order to evaluate the real impact of the combination of cryoablation and immune-modulation. By implementing these recent preclinical findings, we hypothesize that this strategy will confer long-term immunity, and ultimately cure, by exploiting the biology of the tumor and the immune system of the effected individual. We would like to propose clinically this hypothesis in patients who already benefited in routine practice of a cryoablation and required the development of novel therapeutic strategies in order to improve the standard of care and life expectancy. To adequately validate this hypothesis, our study requires to develop a reliable methodology of evaluation. Imaging and immunologic explorations will assess the therapeutic response and may improve the understanding of the mechanisms involved.

Development of such explorations and corresponding biomarkers should also improve the knowledge, provide in the future a better therapeutic evaluation in routine practice and help to widely spread the techniques in primary or secondary care centers.

NEKOMRI
MRI sequence for bronchial wall segmentation and analysis

Pneumology

Fabien BALDACCI, the Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045), 2014

TRAIL funding: 35 000 €

The aim of this project is to develop bronchial wall segmentation and analysis methods on a new MRI sequence for lung acquisition, allowing both a diagnosis by using a MRI instead of CT scan, and the assessment of bronchial remodeling.

7/ Work package "COHORT IMAGING METHODOLOGY"

ABACI
Automated Brain Anatomy for Cohort Imaging

Neurology

Bernard Mazoyer, the Neurofunctional Imaging Group (GIN, UMR5296), 2012

TRAIL funding: 415 000 €

The ABACI project (Automated Brain Anatomy for Cohort Imaging) consists in developing, testing and applying a software toolbox dedicated to the automated processing of structural MRI, acquired in the framework of cohort studies. The project closely fits with the TRAIL laboratory of excellence strategic plan that includes population neuroimaging as one of its key topic. The project federates three neuroimaging teams of TRAIL with two non-TRAIL teams specialized in neuroepidemiology. Unsupervised pipelines for registration, normalization, segmentation and morphometric analysis of structural brain MRI acquired in large longitudinal cohorts will be implemented. These pipelines will deliver global and regional brain anatomy phenotypes for grey matter, white matter and CSF. Whenever possible, widely used and validated public domain neuroimage processing algorithms will be integrated. The project will be linked to and run in parallel with i-Share, a large size MRI cohort of students that will serve as a test cohort for the toolbox. In addition, all participating teams will have the opportunity to test and adapt the tools to their own cohorts and settings, with opening applications in the fields of multiple sclerosis, stroke and brain aging. Commercial use of the toolbox by non- academic users will be proposed.

TRAIL&TRACKS
Atlasing whole brain white matter tracts in 300 healthy humans

Neurology

Laurent Petit, the Neurofunctional Imaging Group (GIN, UMR5296), 2011

TRAIL funding: 97 500 €

The present project proposes, using diffusion tensor imaging (DTI) tractography, to create a normative population-based probabilistic atlas of white matter tracts in healthy humans (TRAIL&TRACKS) for research, clinical and educational purposes. It is based on the BIL&GIN cohort, which includes 300 healthy volunteers aged between 18 and 50 years, balanced between men and women, right-handers and left-handers. The doctoral fellowship application deals with the work to be performed on DTI data, the validation of a method for probabilistic tractography of a set of white matter tracts, the anatomical description of every tracts and how they differ among the 300 subjects in terms of hemispheric asymmetries, gender and handedness. Specific metrics of white matter integrity will be extracted for tracts in the brainstem and projection, association, and commissural tracts. This is not to propose another atlas of the white matter of the human brain, but a tool where inter-hemispheric asymmetry and inter-individual variability will be taken into account into the description of each tract. Once patented, we will deliver an automated tract-labeling tool interfaced with usual neuroimaging analysis software. Several publications are envisaged for the construction of this atlas, including the edition of a textbook and numerical tools such as web-based application for teaching material and training.

COBRASCAN
Quantitative CT and COBRA cohort for study of chronic obstructive pulmonary disease

Pneumology

François Laurent, the Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045), 2013

TRAIL funding: 134 448 €

Chronic obstructive pulmonary disease (COPD) is expected to be the 3rd leading cause of mortality and the 5th cause of morbidity in the world by 2020. The pulmonary component of COPD is characterized by airflow limitation that is not fully reversible. Airflow limitation is defined by pulmonary function tests (PFT) results and is caused by narrowing of small airways which is a consequence of the combination of airways wall thickening due to airway wall remodeling and loss of tethering force due to emphysematous lung destruction. However patients with the same airflow limitation will present with different clinical subtypes, in term of severity and outcome. The effect of certain treatments can be only proved in term of primary outcomes if there is a mean other than pulmonary function tests for classifying patients into phenotypes in longitudinal studies. The prognostic impact of these phenotypes is still poorly known.

Advance in CT technology and CT image analysis programs, i.e. CT algorithms herein referred to as quantitative CT (QCT) can be used to analyse in details the morphological changes involved in COPD, i.e. the severity of emphysema, airways dimensions, small airways obstruction and small pulmonary vessels on CT images. Our group has developed software needed for combined quantitative analysis of structural changes of proximal and distal airways and can use software dedicated to quantification of emphysema and pulmonary vessels. However, there is still no consensus in term of the best appropriate

algorithms for quantification.

The COBRA project directed by INSERM relies on a national cohort of 500 patients. The main objective of the COBRA cohort is to determine clinical, biological and genetical determinants of the outcome of COPD patients. The recruitment started in 2008 and inclusion of 500 patients is finally expected, 211 of them being included so far. Clinical, functional and biological variables will be followed up over 10 years. COBRASCAN will consist in a QCT acquisition performed in each patient included into the COBRA cohort during the 5th year after inclusion. The hypothesis is that a CT quantitative morphological analysis reflecting lung parenchymal destruction (emphysema), bronchial wall remodeling of large and small airways and changes in pulmonary vessels has a significant prognostic impact. The originality of COBRASCAN will be its ability to identify phenotypes of COPD patients based on multiple morphological criteria and to specify their prognostic value. The innovative aspect of the project is the development of a single new software able to combine the acquisition of objective data of emphysema, bronchial wall thickening of proximal and distal airways, large vessels size, reflecting changes of the whole respiratory system. The software will be built based on the most robust and reproducible algorithms available and the most relevant variables for each type of morphological changes will be determined. The study will specify the role of quantitative CT as a biomarker of COPD, and its position in on-going clinical trials. Phenotyping COPD into appropriate subgroups using imaging in addition to PFT is likely to play a role in pharmacological research.

Annex B

Publications and scientific communication

B.1
202 articles in peer-reviewed journals since 2012

B.2
150 scientific communication

B.1 202 articles in peer-reviewed journals since 2012

Main figures

NUMBER OF ARTICLES PER YEAR

WP	2011	2012	2013	2014	Total
1		5	5	3	13
2			2	7	9
3			3	8	11
4		1	2	7	10
5		7	11	12	30
6		23	38	42	103
7	2	6	4	14	26
Total	**2**	**42**	**65**	**93**	**202**

NUMBER OF ARTICLES PER YEAR

WP	Not defined	<5	5-10	>10	Total
1		12	1		13
2	1	5	3		9
3		9	2		11
4		4	3	3	10
5	3	19	5	3	30
6	18	65	16	4	103
7		10	15	1	26
TOTAL	**22**	**124**	**45**	**11**	**202**

NUMBER OF ARTICLES IN HIGH IMPACT FACTOR JOURNALS

Journal name	Impact Factor	Number of articles
Nature	42,351	2
nature genetics	35,209	1
Science	34,4	1
Journal of the Alzheimer's Association	17,472	1
Neuron	15,982	1
Angewandte Chemie	13,734	1
J Allergy Clin Immunol.	12,047	1
Am J Respir Crit Care Med	11,041	2
Nat Commun.	10,742	1
Total		**11**

Detail of publications per work package

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
1	MRGHIFU	De la Rosa X, Santalucía T, Fortin P-Y, Purroy J, Calvo M, Salas-Perdomo A, Justicia C, Couillaud F & Planas AM (2013). In vivo imaging of induction of heat-shock protein-70 gene expression with fluorescence reflectance imaging and intravital confocal microscopy following brain ischaemia in reporter mice. Eur J Nucl Med Mol Imaging 40, 426–438	Eur J Nucl Med Mol Imaging	2013	5,217	5-10
1	MRGHIFU	Pinel K, Ventura, M, Lacoste J, Plane, G & Couillaud, F (2013). Long-term in vivo imaging of translated RNAs for gene therapy. Gene Therapy, 21, 434-439	Gene Therapy	2013	4,321	<5
1	MRGHIFU	Devaud, C. ; Rousseau, B. ; Netzer, S. ; Pitard, V. , Paroissin, C.; Costet, P. , Moreau, J.F ; Couillaud,F. Dechanet-Merville,J.; Capone, M. (2013) Anti-metastatic potential of human T cells in an orthotopic mouse xenograft model of colon carcinoma. Cancer Immunology, Immunotherapy, Cancer Immunol Immunother 62, 1199–1210	Cancer Immunol Immunother	2013	3,943	<5
1	MRGHIFU	Fortin P-Y, Genevois C, Chapolard M, Santalucía T, Planas AM & Couillaud F (2014). Dual-reporter in vivo imaging of transient and inducible heat-shock promoter activation. Biomedical Optics Express 5, 457.	Biomedical Optics Expres	2014	3,497	<5
1	MRGHIFU	Denis de Senneville B, Roujol S, Jaïs P, Moonen CTW, Herigault G, Quesson B. Feasibility of fast MR-thermometry during cardiac radiofrequency ablation; NMR Biomed. 2012; 25(4):556–62.	NMR Biomed	2012	3,214	<5
1	MRGHIFU	Hey S, Cernicanu A, Senneville BD, Roujol S, Ries M, Jaïs P, Moonen CT, Quesson B. Towards optimized MR thermometry of the human heart at 3T. NMR Biomed, 2012;25(1):35–43	NMR Biomed	2012	3,214	<5
1	MRGHIFU	Lepetit-Coiffé M, Yudina, A P, Lourenco de Oliveira R, Poujol C, Couillaud F & Moonen CTW (2013). 2D-uptake percentage maps for evaluation of US mediated fluorescent model drug delivery. Mol. Imag. Biol. 15, 523–533.	Mol. Imag. Biol	2013	3,1	<5
1	MRGHIFU	Deckers R, Debeissat C, Fortin P-Y, Moonen CTW & Couillaud F (2012). Arrhenius analysis of the relationship between hyperthermia and Hsp70 promoter activation: A comparison between ex vivo and in vivo data. Int J Hyperthermia 28, 441-450.	Int J Hyperthermia	2012	2,769	<5
1	MRGHIFU	Fortin P-Y, Genevois C, Koenig A, Heinrich E, Texier I & Couillaud F (2012). Detection of brain tumors using fluorescence diffuse optical tomography and nanoparticles as contrast agents. J Biomed Opt 17, 126004.	J Biomed Opt	2012	2,752	<5
1	MRGHIFU	Elbes D, Denost Q, Robert B, Köhler MO, Tanter M, Quesson B. Magnetic Resonance Imaging for the Exploitation of Bubble-Enhanced Heating by High-Intensity Focused Ultrasound: A Feasibility Study in ex Vivo Liver. Ultrasound Med Biol. 2014 May;40(5):956-64.	Ultrasound Med Biol.	2014	2,416	<5
1	MRGHIFU	Elbes D, Denost, Q, Laurent C, Trillaud H, Rullier A, Quesson B. A Preclinical Study of in vivo MR-guided Bubble Enhanced Heating in Pig Liver, Ultrasound Med Biol. 2013 Aug;39(8):1388-97.	Ultrasound Med Biol.	2013	2,416	<5
1	MRGHIFU	Roujol S, Benois–Pineau J, de Senneville BD, Ries M, Quesson B, Moonen CT, (2012) .Robust real–time–constrained estimation of respiratory motion for interventional MRI on mobile organs, IEEE Trans Inf Technol Biomed, 16(3):365–74.	IEEE Trans Inf Technol Biomed	2012	1,98	<5
1	MRGHIFU	Garaio E, Collantes JM, Garcia JA, Plazaola F, Mornet S, Couillaud F & Sandre O (2014). A wide-frequency range AC magnetometer to measure the specific absorption rate in nanoparticles for magnetic hyperthermia. Journal of Magnetism and Magnetic Materials; in press	Journal of Magnetism and Magnetic Materials	2014	1,892	<5
2	ACTE	Compensatory recruitment of neural resources in aging and chronic alcoholism, Chanraud S. and Sullivan E.V. Handbook of Clinical Neurology. 2014;125:369-80. doi: 10.1016/B978-0-444-62619-6.00022-7.	Handbook of Clinical Neurology	2014	NC	NC
2	DIMI	Tourdias T, Saranathan M, Levesque IR, Su J, Rutt BK. "Visualization of intra-thalamic nuclei with optimized white-matter-nulled MPRAGE at 7T". Neuroimage. 2014 Jan 1;84:534-45.	Neuroimage	2014	6,25	5-10
2	HRDTI	P. Coupé, J. V. Manjon, M. Chamberland, M. Descoteaux, B. Hiba. Collaborative patch-based super-resolution for diffusion-weighted images. NeuroImage, 83:245-261, 2013.	NeuroImage	2013	6,25	5-10
2	DIMI	Saranathan M, Tourdias T, Kerr AB, Berstein JD, Kerchner GA, Han MH, Rutt BK. "Optimization of Magnetization-Prepared 3-Dimensional Fluid Attenuated Inversion Recovery Imaging for Lesion Detection at 7 T". Investigative Radiology 2014 May 49(5):290-8.	Investigative Radiology	2014	5,46	5-10
2	ACTE	Brain functional connectivity and morphology changes in medication-overuse headache: Clue for dependence-related processes?, Chanraud S, Di Scala G, Dilharreguy B, Schoenen J, Allard M, Radat F. Cephalalgia. 2014 Jan 21;34(8):605-615.	Cephalalgia	2014	4,121	<5
2	HRDTI	J. V. Manjon, P. Coupé, L. Concha, A. Buades, D. L. Collins, M. Robles. Diffusion Weighted Image Denoising using overcomplete Local PCA. PLoS ONE 8(9): e73021. doi:10.1371/journal.pone.0073021	PLoS ONE	2013	3,73	<5
2	DIMI	Saranathan M, Tourdias T, Bayram E, Ghanouni P, Rutt BK. "Optimization of white matter nulled magnetization prepared rapid gradient echo (MP-RAGE) imaging". Magn Reson Med 2014 May 29 [Epub ahead of print] .	Magn Reson Med	2014	3,26	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
2	NEWFISP	Self-gated bSSFP sequences to detect iron-labeled cancer cells and/or metastases in vivo in mouse liver at 7 Tesla. Ribot EJ, Duriez TJ, Trotier AJ, Thiaudiere E, Franconi JM, Miraux S. J Magn Reson Imaging. 2014 Jul 2. doi: 10.1002/jmri.24688.	J Magn Reson Imaging	2014	2,3	<5
2	NEWFISP	Time-resolved TOF MR angiography in mice using a prospective 3D radial double golden angle approach. Trotier AJ, Lefrançois W, Ribot EJ, Thiaudiere E, Franconi JM, Miraux S. Magn Reson Med. 2014 Mar 10. doi: 10.1002/mrm.25201.	J Magn Reson Imaging	2014	2,3	<5
3	ONCOFLUX	Bianchi A, Dufort S, Lux F, Fortin PY, Tassali N, Tillement O, Coll JL, Crémillieux Y. Targeting and in vivo imaging of non-small-cell lung cancer using nebulized multimodal contrast agents. Proc Natl Acad Sci U S A. 2014 Jun 24;111(25):9247-52.	Proc Natl Acad Sci U S A	2014	9,737	5-10
3	ONCOFLUX	Nebulized gadolinium-based nanoparticles : a theranostic approach for lung tumor imaging and radiosensitization. Dufort S, Bianchi A, Henry M, Lux F, Le Duc G, Josserand V, et al. SMALL. 2014 Sep 8. doi: 10.1002/smll.201401284. [Epub ahead of print]	SMALL	2014	7,823	5-10
3	TRAILDNP	Alkoxyamines: toward a new family of theranostic agents against cancer. Moncelet D, Voisin P, Koonjoo N, Bouchaud V, Massot P, Parzy E, Audran G, Franconi JM, Thiaudière E, Marque SR, Brémond P, Mellet P. Mol Pharm. 2014 Jul 7;11(7):2412-9.	Mol Pharm	2014	4,12	<5
3	TRAILDNP	Overhauser-enhanced MRI of elastase activity from in vitro human neutrophil degranulation. Parzy E, Bouchaud V, Massot P, Voisin P, Koonjoo N, Moncelet D, Franconi JM, Thiaudière E, Mellet P. PLoS One. 2013;8(2):e57946.	PLoS One.	2013	3,73	<5
3	ONCOFLUX	Andrea Bianchi, François Lux, Olivier Tillement, Yannick Crémillieux. Contrast enhanced lung MRI in mice using ultra-short echo time radial imaging and intratracheally administrated Gd-DOTA-based nanoparticles. Magn Reson Med. 2013 Nov;70(5):1419-26.	Magn Reson Med	2013	3,27	<5
3	ONCOFLUX	Andrea Bianchi, Annaïg Ozier, Olga Ousova, Gérard Raffard, Yannick Crémillieux. Ultrashort-TE MRI longitudinal study and characterization of a chronic model of asthma in mice: inflammation and bronchial remodeling assessment. NMR Biomed. 2013 Nov;26(11):1451-9.	NMR Biomed	2013	3,214	<5
3	ONCOFLUX	Bianchi A, Dufort S, Fortin PY, Lux F, Raffard G, Tassali N, Tillement O, Coll JL, Crémillieux Y. In vivo MRI for effective non-invasive detection and follow-up of an orthotopic mouse model of lung cancer. NMR Biomed. 2014 Aug;27(8):971-9.	NMR Biomed	2014	3,214	<5
3	TRAILDNP	In vivo Overhauser-enhanced MRI of proteolytic activity.Koonjoo N, Parzy E, Massot P, Lepetit-Coiffé M, Marque SR, Franconi JM, Thiaudiere E, Mellet P. Contrast Media Mol Imaging. 2014 Sep;9(5):363-71.	Contrast Media Mol Imaging	2014	2,872	<5
3	ONCOFLUX	Mathieu Lederlin, Yannick Crémillieux. Three-Dimensional Assessment of Lung Tissue Density using a Clinical Ultrashort Echo Time (UTE) at 3T: a Feasibility Study in Healthy Subjects. J Magn Reson Imaging. 2014 Oct;40(4):839-47	J Magn Reson Imaging	2014	2,3	<5
3	ONCOFLUX	Sancey L, Lux F, Kotb S, Roux S, Dufort S, Bianchi A, Crémillieux Y, Fries P, Coll JL, Rodriguez-Lafrasse C, Janier M, Dutreix M, Barberi-Heyob M, Boschetti F,Denat F, Louis C, Porcel E, Lacombe S, Le Duc G, Deutsch E, Perfettini JL, Detappe A, Verry C, Berbeco R, Butterworth KT, McMahon SJ, Prise KM, Perriat P, Tillement O. The use of theranostic gadolinium-based nanoprobes to improve radiotherapy efficacy. Br J Radiol. 2014 Sep;87(1041):20140134.	Br J Radiol	2014	1,752	<5
3	ONCOFLUX	Bianchi A, Dufort S, Lux F, Courtois A, Tillement O, Coll JL, Crémillieux Y. Quantitative biodistribution and pharmacokinetics of multimodal gadolinium-based nanoparticles for lungs using ultrashort TE MRI. MAGMA. 2014 Aug;27(4):303-16.	MAGMA	2014	1,353	<5
4	PIAF	Cholesterol and cancer, in the balance, S. Silvente-Poirot et al., Science, 2014, 343, 1445-6.	Science	2014	34,4	>10
4	IMMELAPT	Durand D, Lisi, S, Ravelet C, Dausse E, Peyrin E*, Toulmé JJ* (2014) Riboswitches based on kissing complexes for the detection of small ligands. Angewandte Chemie, 53, 6942-6945.	Angewandte Chemie	2014	13,734	>10
4	PIAF	Dendrogenin A arises from cholesterol and histamine metabolism and shows cell differentiation and anti-tumour properties, S. Silvente-Poirot et al., Nat Commun. 2013, 4, 1840.	Nat Commun.	2013	10,742	>10
4	PRITOR	Morgat C, Mishra AK, Varshney R, Allard M, Fernandez P, Hindié E. Targeting Neuropeptide Receptors for Cancer Imaging and Therapy: Perspectives with Bombesin, Neurotensin, and Neuropeptide-Y Receptors. J Nucl Med. 2014;55(10):1650-1657.	J Nucl Med.	2014	5,774	5-10
4	PRITOR	Morgat C, Mazère J, Fernandez P, Buj S, Vimont D, Schulz J, Lamare F. Methodological proposal to standardize dose-calibrators for new -+- emitters. Eur J Nucl Med Mol Imaging. 2014;41(Suppl 2):151-750.	Eur J Nucl Med Mol Imaging	2014	5,217	5-10
4	PRITOR	Champion C, Zanotti-Fregonara P, Quinto M. A. Morgat C, Hindié E. Comparative efficacy of 90Y, 177Lu and 111In for the irradiation of tumor cells and micrometastases: a Monte Carlo study using CELLDOSE. Eur J Nucl Med Mol Imaging. 2014;41(Suppl 2):151-750.	Eur J Nucl Med Mol Imaging	2014	5,217	5-10
4	PIAF	[18F]Si-RiboRGD : the winning combination. From the design and the synthesis to the imaging of anb3 integrins in melanoma tumors., E. Amigues, J. Schulz, M. Szlosek-Pinaud, P. Fernandez, S. Silvente-Poirot, S. Brillouet, F. Courbon, E. Fouquet., ChemPlusChem, 2012, 77, 345-349.	ChemPlusChem	2012	3,242	<5
4	PRITOR	Morgat C, Hindié E, Mishra AK, Allard M, Fernandez P. Gallium-68: chemistry and radiolabeled peptides exploring different oncogenic pathways. Cancer Biother Radiopharm. 2013;28(2):85-97.	Cancer Biother Radiopharm	2013	1,738	<5
4	PRITOR	Morgat C, Mazère J, Fernandez P, Buj S, Vimont D, Schulz J, Lamare F. A phantom-based method to standardize dose-calibrators for new -+- emitters. Nucl Med Commun. 2014 Oct 15. [Epub ahead of print].	Nucl Med Commun	2014	1,371	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
4	IMMELAPT	Evadé L, Dausse E, , Taouji S, Daguerre E, Chevet E, Toulmé JJ (2014) Aptamer-mediated nanoparticle interactions ; from oligonucleotide-protein complexes to SELEX screens. Methods Mol Biol, in press.	Methods Mol Biol	2014	1,29	<5
5	INNES	Sampol, D., E. Ostrofet, M. L. Jobin, G. Raffard, S. Sanchez, V. Bouchaud, J. M. Franconi, G. Bonvento and A. K. Bouzier-Sore (2013). «Glucose and lactate metabolism in the awake and stimulated rat: a (13)C-NMR study.» Front Neuroenergetics 5: 5.	Front Neuroenergetics	2013	NC	NC
5	INNES	Rodrigues, T. B., J. Valette and A. K. Bouzier-Sore (2013). «13C NMR spectroscopy applications to brain energy metabolism.» Front Neuroenergetics 5: 9.	Front Neuroenergetics	2013	NC	NC
5	SCICOG&REACTIV, IBIONI	Ruet A, Brochet B, Syndrome cliniquement isolé: la prise en charge thérapeutique. Neurologies, 2012, 15 : 187-192	Neurologies	2012	NC	NC
5	TRANSFEAR	Amygdala interneuron subtypes control fear learning through disinhibition.Wolff SB, Gründemann J, Tovote P, Krabbe S, Jacobson GA, Müller C, Herry C, Ehrlich I, Friedrich RW, Letzkus JJ, Lüthi A. Nature. 2014 May 22;509(7501):453-8.	Nature	2014	42,351	>10
5	TRANSFEAR	Prefrontal parvalbumin interneurons shape neuronal activity to drive fear expression. Courtin J, Chaudun F, Rozeske RR, Karalis N, Gonzalez-Campo C, Wurtz H, Abdi A, Baufreton J, Bienvenu TC, Herry C. Nature. 2014 Jan 2;505(7481):92-6.	Nature	2014	42,351	>10
5	TRANSFEAR	Long-range connectivity defines behavioral specificity of amygdala neurons. Senn V, Wolff SB, Herry C, Grenier F, Ehrlich I, Gründemann J, Fadok JP, Müller C, Letzkus JJ, Lüthi A. Neuron. 2014 Jan 22;81(2):428-37.	Neuron	2014	15,982	>10
5	SCICOG&REACTIV, IBIONI	Ruet A, Deloire MS, Charré-Morin J, Hamel D, Brochet B. Cognitive impairment differs between primary progressive and relapsing-remitting MS. Neurology, 2013 80:1501-1508.	Neurology	2013	8,25	5-10
5	SCICOG&REACTIV, IBIONI	Arnett PA, Brochet B. How Can Cognitive Reserve in Multiple Sclerosis Inform Clinical Care? Neurology. 2013 2013;80.	Neurology	2013	8,25	5-10
5	SCICOG&REACTIV, IBIONI	Tourdias T, Roggerone S, Filippi M, Kanagaki M, Rovaris M, Miller DH, Petry KG, Brochet B, Pruvo JP, Radüe EW, Dousset V. Assessment of disease activity in multiple sclerosis phenotypes with combined gadolinium- and superparamagnetic iron oxide-enhanced MR imaging. Radiology. 2012 Jul;264(1):225-33.	Radiology	2012	6,341	5-10
5	TRANSFEAR	Differential cerebellar functional interactions during an interference task across multiple sclerosis phenotypes. Rocca MA, Bonnet MC, Meani A, Valsasina P, Colombo B, Comi G, Filippi M. Radiology. 2012 Dec;265(3):864-73.	Radiology	2012	6,341	5-10
5	MIMATHUMAB	Nanoparticles functionalised with an anti-platelet human antibody for in vivo detection of atherosclerotic plaque by Magnetic Resonance Imaging. Manuscript «»JN2014154R1»» under revision by Nanomedicine: Nanotechnology, Biology, and Medicine; Marie-Josée Jacobin-Valat, PhD; Jeanny Laroche-Traineau, PhD; Mélusine Larivière; Stéphane Mornet, PhD; Stéphane Sanchez; Marc Biran, PhD; Caroline Lebaron; Julien Boudon, PhD; Sabrina Lacomme; Martine Cérutti, PhD; Gisele Clofent-Sanchez, PhD	Nanomedecine	2014	5,978	5-10
5	SCICOG&REACTIV, IBIONI	Ruet A, Deloire MS, Charré-Morin J, Hamel D, Brochet B. A new computerised cognitive test for the detection of information processing speed impairment in multiple sclerosis. Mult Scler. 2013 Oct;19(12):1665-72.	Mult Scler	2013	4,472	<5
5	SCICOG&REACTIV, IBIONI	Ruet A, Arrambide G, Brochet B, Auger C, Simon E, Rovira A, Montalban X, Tintoré M. Early predictors of multiple sclerosis after a typical clinically isolated syndrome. Mult Scler. 2014 May 19. 1352458514533397.	Mult Scler	2014	4,472	<5
5	SCICOG&REACTIV, IBIONI	Hamel D, Deloire M, Saubusse A, Brochet B. Including ecological assessment in cognitive screening: a new approach to detect cognitive impairment in MS patients. REACTIV Study. Mult Scler. 2014 Sep;20(1 Suppl)	Mult Scler	2014	4,472	<5
5	INNES	Bouzier-Sore, A. K. and L. Pellerin (2013). «Unraveling the complex metabolic nature of astrocytes.» Front Cell Neurosci 7: 179.	Front Cell Neurosci	2013	4,2	<5
5	TRANSFEAR	Persistence of amygdala gamma oscillations during extinction learning predicts spontaneous fear recovery. Courtin J, Karalis N, Gonzalez-Campo C, Wurtz H, Herry C. Neurobiol Learn Mem. 2014 Sep;113:82-9.	Neurobiol Learn Mem	2014	4,035	<5
5	SCICOG&REACTIV, IBIONI	Ruet A, Deloire M, Hamel D, Ouallet JC, Petry K, Brochet B. Cognitive impairment, health-related quality of life and vocational status at early stages of multiple sclerosis: a 7-year longitudinal study. J Neurol. 2013 Mar;260(3):776-84	J Neurol	2013	3,841	<5
5	SCICOG&REACTIV, IBIONI	Okuda DT, Siva A, Kantarci O, Inglese M, Katz I, Tutuncu M, Keegan BM, Donlon S, Hua le H, Vidal-Jordana A, Montalban X, Rovira A, Tintoré M, Amato MP, Brochet B, de Seze J, Brassat D, Vermersch P, De Stefano N, Sormani MP, Pelletier D, Lebrun C. ,Radiologically isolated syndrome: 5-year risk for an initial clinical event. Radiologically Isolated Syndrome Consortium (RISC); Club Francophone de la Sclérose en Plaques (CFSEP). PLoS One. 2014 Mar 5;9(3):e90509. doi: 10.1371/journal.pone.0090509. eCollection 2014.	PlosOne	2014	3,73	<5
5	TRANSFEAR	Prefrontal neuronal circuits of contextual fear conditioning. Rozeske RR, Valerio S, Chaudun F, Herry C. Genes Brain Behav. 2014	Genes Brain Behav	2014	3,505	<5
5	TRANSFEAR	Medial prefrontal cortex neuronal circuits in fear behavior. Courtin J, Bienvenu TC, Einarsson EÖ, Herry C.Neuroscience. 2013 Jun 14;240:219-42.	Neuroscience	2013	3,327	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
5	INNES	Marie Hennebelle, Maggie Roy, Valérie St-Pierre, Alexandre Courchesne-Loyer, Mélanie Fortier, Anne-Karine Bouzier-Sore, Jean-Louis Gallis, Marie-Christine Beauvieux, Stephen C. CunnaneEnergy restriction does not prevent insulin resistance but does prevent liver steatosis in aging rats on a Western-style diet. Nutrition. 01/2014	Nutrition	2014	3,151	<5
5	INNES	Roy, M., M. Hennebelle, V. St-Pierre, A. Courchesne-Loyer, M. Fortier, A. K. Bouzier-Sore, J. L. Gallis, M. C. Beauvieux and S. C. Cunnane (2013). «Long-term calorie restriction has minimal impact on brain metabolite and fatty acid profiles in aged rats on a Western-style diet.» Neurochem Int 63(5): 450-457.	neurochem int	2013	2,874	<5
5	INNES	Beauvieux, M. C., C. Chambre, A. Stephant, H. Gin, A. K. Bouzier-Sore, B. Chaarani, G. Raffard, E. Richard, C. Castain, P. Couzigou and J. L. Gallis (2013/2014). «High-fructose diet enhances cerebral neurodegenerative process; preventive effect of resveratrol. A nuclear magnetic resonance imaging and spectroscopy study on rat nutritional models.» Nutrition and aging 2(1): 15-34.	Nutrition and aging	2014	2,659	<5
5	SCICOG&REACTIV, IBIONI	Ruet A, Hamel D, Deloire MSA, Charré-Morin J, Saubusse A, Brochet B. Information processing speed impairment and cerebellar dysfunction in relapsing-remitting multiple sclerosis. J Neurol Sci 2004, DOI: 10.1016/j.jns.2014.10.008	J Neurol Sci	2014	2,379	<5
5	SCICOG&REACTIV, IBIONI	Brochet B. [Is MRI monitoring useful in clinical practice in patients with relapsing-remitting multiple sclerosis? Yes.] Rev Neurol (Paris). 2013 Nov;169(11):858-63.	Rev Neurol Paris journal	2013	0,601	<5
5	SCICOG&REACTIV, IBIONI	*Corlobé A, Renard D, Goizet C, Berger E, Rumbach L, Robinson A, Dupuy D, Touzé E, Zéphir H, Vermersch P, Brochet B, Edan G, Deburghgraeve V, Créange A, Castelnovo G, Cohen M, Lebrun-Frenay C, Boespflug-Tanguy O, Labauge P. [Cavitary lesions in multiple sclerosis: multicenter study on twenty patients]. Rev Neurol (Paris). 2013 Dec;169(12):965-9. doi: 10.1016/j.neurol.2013.02.010. Epub 2013 Oct 17. French.	Rev Neurol Paris journal	2013	0,601	<5
6	CRYOIMMUNO	Cornelis F, et al. Les ablations thermiques percutanées. Imagerie de l'appareil génito-urinaire. Flammarion 2014. In Press	Flammarion	2014	NC (book)	NC
6	CRYOIMMUNO	Cornelis F, et al. Magnetic resonance imaging of kidneys and ureters. Magnetic Resonance Imaging. Taylor & Francis 2014. In Press	Taylor & Francis	2014	NC (book)	NC
6	CRYOIMMUNO	Cornelis F, Solomon S. Imaging in interventional oncology : role of image guidance. Interventional Oncology: Principles and Practice. Cambridge University Press 2014. In Press	Cambridge University Press	2014	NC (book)	NC
6	CRYOIMMUNO	Cornelis F, et al. Prostate ablations. Interventional Oncology: Principles and Practice. Cambridge University Press 2014. In Press	Cambridge University Press	2014	NC (book)	NC
6	CRYOIMMUNO	Cornelis F, Le Bras Y, Rigou G, Correas JM, Grenier N. Contrast-Enhanced Ultrasound in Prostate Cancer. Image Guided Prostate Cancer Treatments. Springer-Verlag Berlin Heidelberg 2014, pp 47-53.	Springer-Verlag Berlin Heidelberg	2014	NC (book)	NC
6	MOD	J. V. Manjon, S.F. Eskildsen, P. Coupé, J. E. Romero, D. L. Collins, M. Robles. NICE: Non-local Intracranial Cavity Extraction, International Journal of Biomedical Imaging, Accepted, 2014.	International Journal of Biomedical Imaging	2014	NC	NC
6	MOD	J. Jouganous, T. Colin, O. Saut and F. Cornelis, Patient specific simulation of tumor growth, response to the treatment and relapse of a lung metastasis: a clinical case. To appear in computational surgery	computational surgery	2014	NC	NC
6	MOD	D. Lombardi, T. Colin, A. Iollo, O. Saut, F. Bonichon, J Palussière, Some models for the prediction of tumor growth : general framework and applications to metastases in the lung, in : M.Garbey, B.Bass, S.Berceli, C.Collet and P.Cerveri, Computational Surgery and	computational surgery	2014	NC	NC
6	MOD	M. Bergmann, T. Colin, A. Iollo, D. Lombardi, O. Saut, and H. Telib, Reduced Order Models at Work in Aeronautics and Medicine, in Springer MS&A series, Vol. 8: Reduced Order Methods for modeling and computational reduction (A. Quarteroni, G. Rozza, Eds). 2014.	Springer MS&A series	2014	NC	NC
6	MOD	T. Colin, F. Cornelis, J. Jouganous, M. Martin, O. Saut, Patient Specific Image Driven Evaluation of the Aggressiveness of Metastases to the Lung, Conférence MICCAI 2014, Med Image Comput Comput Assist Interv. 2014;17(Pt 1):553-60.	Med Image Comput Comput Assist Interv.	2014	NC	NC
6	MOD	Laffon E,de Clermont H,Lamare F,Marthan R, Variability of total lesion glycolysis by 18F-FDG-positive tissue thresholding in lung cancer. J Nucl Med Technol. 2013 Sep;41(3):186-91.	J Nucl Med Technol	2013	NC	NC
6	MOD	P. Coupé, P. Hellier, X. Morandi, C. Barillot. 3D Rigid Registration of Intraoperative Ultrasound and Preoperative MR Brain Images based on Hyperechogenic Structures. International Journal of Biomedical Imaging, Volume 2012 (2012), Article ID 531319, 14 pages. doi:10.1155/2012/531319.	International Journal of Biomedical Imaging	2012	NC	NC
6	MOD	Bentourkia M., Lamare F., Allard M., Fernandez P. (2012): Modeling of human glioblastoma with spectral analysis in 18F-FMISO-PET imaging. IEEE, NSS&MIC, M22-58, 4009-4010.	IEEE, NSS&MIC	2012	NC	NC
6	CRYOIMMUNO	Takaki H, Litchman T, Covey A, Cornelis F, Maybody M, Getrajdman GI, Sofocleous CT, Brown KT, Solomon SB, Alago W, Erinjeri JP.Hepatic Artery Embolization for Liver Metastasis of Gastrointestinal Stromal Tumor Following Imatinib and Sunitinib Therapy. J Gastrointest Cancer. 2014 Oct 31. [Epub ahead of print]	J Gastrointest Cancer	2014	NC	NC
6	CRYOIMMUNO	Colin T, Cornelis F, Jouganous J, Martin M, Saut O. Patient specific image driven evaluation of the aggressiveness of metastases to the lung. Med Image Comput Assist Interv. 2014;17(Pt 1):553-60.	Med Image Comput Assist Interv	2014	NC	NC
6	COBRASCAN	Dournes G, Montaudon M, Berger P, Laurent F. In Vivo Computed Tomography as a Research Tool to Investigate Asthma and COPD: Where Do We Stand? J Allergy (Cairo) 2012;2012:972479	J Allergy (Cairo)	2012	NC	NC

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
6	COBRASCAN	Burgel PR, Bergeron A, de Blic J, Bonniaud P, Bourdin A, Chanez P, Chinet T, Dalphin JC, Devillier P, Deschildre A, Didier A, Kambouchner M, Knoop C, Laurent F, Nunes H, Perez T, Roche N, Tillie-Leblond I, Dusser D.Small airways diseases, excluding asthma and COPD: an overview.Eur Respir Rev. 2013 Jun 1;22(128):131-47. doi: 10.1183/09059180.00001313.PMID: 23728867 [PubMed - in process]	Eur Respir Rev	2013	NC	NC
6	COBRASCAN	Balacey H, Dournes G, Desbarats P, Montaudon M, Domenger JP, Laurent F A new processing sequence to assess airways using 3D CT-scan. Imaging Processing (ICIP) ; 2013 : 2339-43	Imaging Processing (ICIP)	2013	NC	NC
6	MOD	A Zandifar, V Fonov, P Coupé, J.C. Pruessner, D.L. Collins. A unified assessment of fully automated hippocampus segmentation methods, Alzheimer's & Dementia: The Journal of the Alzheimer's Association 10 (4):86, 2014.	Journal of the Alzheimer's Association	2014	17,472	>10
6	COBRASCAN	Dournes G, Marthan R, Berger P, Montaudon M, Laurent F. Bronchi wall and lumen volumes to assess airway remodeling in asthma by using CT: an innovative method? J Allergy Clin Immunol. 2014 Jun;133(6):1777.	J Allergy Clin Immunol.	2014	12,047	>10
6	COBRASCAN	Dournes G, Berger P, Laurent F. Airway Compliance Studied by Lumen Area Changes Alone Cannot Discriminate between Collapsibility and Elasticity. Am J Respir Crit Care Med. 2013 Jan 1;187(1):107-8. No abstract available.PMID: 23281353 [PubMed - indexed for MEDLINE]	Am J Respir Crit Care Med	2013	11,041	>10
6	COBRASCAN	Dournes G, Laurent F, Coste F, Dromer C, Blanchard E, Picard F, Baldacci F, Montaudon M, Girodet PO, Marthan R, Berger P. CT Measurement of Airway Remodeling and Emphysema in Advanced COPD: Correlation to Pulmonary Hypertension. Am J Respir Crit Care Med. 2014 Nov 13. [Epub ahead of print]	Am J Respir Crit Care Med	2014	11,041	>10
6	CRYOIMMUNO	Cornelis F, Rigou G, Le Bras Y, Coutouly X, Hubrecht R, Yacoub M, Pasticier G, Robert G, Grenier N. Real-time Contrast-enhanced Transrectal US-guided Prostate Biopsy: Diagnostic Accuracy in Men with Previously Negative Biopsy Results and Positive MR Imaging Findings. Radiology. 2013 Oct;269(1):159-66.	Radiology	2013	6,341	5-10
6	MOD	P. Coupé, J. V. Manjon, M. Chamberland, M. Descoteaux, B. Hiba. Collaborative patch-based super-resolution for diffusion-weighted images. NeuroImage, 83:245-261, 2013.	NeuroImage	2013	6,252	5-10
6	MOD	B. Aubert-Broche, V. Fonov, D. Garcia-Lorenzo, A. Mouiha, N. Guizard, P. Coupé, S. Eskildsen, D. L. Collins. A new method for structural volume analysis of longitudinal brain MRI data and its application in studying the growth trajectories of anatomical brain structures in childhood. NeuroImage 82: 393-402, 2013.	NeuroImage	2013	6,252	5-10
6	MOD	T. Tong, R. Wolz, P. Coupé, J. V. Hajnal, D. Rueckert and ADNI. Segmentation of MR images via Discriminative Dictionary Learning and Sparse Coding: Application to Hippocampus Labeling. NeuroImage 76: 11-23, 2013.	NeuroImage	2013	6,252	5-10
6	MOD	S. Hu, J.C. Pruessner, P. Coupé, D. L. Collins. Volumetric Analysis of Medial Temporal Lobe Structures in Brain Development from Childhood to Adolescence. Neuroimage 74: 276-287, 2013.	NeuroImage	2013	6,252	5-10
6	MOD	S. F. Eskildsen, P. Coupé, D. Garcia-Lorenzo, V. Fonov, J. Pruessner, D. L Collins and ADNI. Prediction of Alzheimer's disease in subjects with mild cognitive impairment from the ADNI cohort using patterns of cortical thinning. NeuroImage, 65:511-521, 2013.	NeuroImage	2013	6,252	5-10
6	MOD	P. Coupé, S. F. Eskildsen, J. V. Manjon, V. Fonov, J. C. Pruessner, M. Allard, D. L. Collins and ADNI. Scoring by Nonlocal Image Patch Estimator for Early Detection of Alzheimer's Disease. NeuroImage: Clinical, 1(1):141–152, 2012.	NeuroImage	2012	6,252	5-10
6	MOD	S. F. Eskildsen, P. Coupé, K. K. Leung, V. Fonov, J. V. Manjon, N. Guizard, S. Wassef, L.R. Østergaard, D. L. Collins and ADNI. BEaST: Brain Extraction based on nonlocal Segmentation Technique. NeuroImage, 59(3):2362-2373, 2012.	NeuroImage	2012	6,252	5-10
6	MOD	P. Coupé, S. F. Eskildsen, J. V. Manjon, V. Fonov, D. L. Collins and ADNI. Simultaneous Segmentation and Grading of Anatomical Structures for Patient's Classification: Application to Alzheimer's Disease. NeuroImage, 59(4):3736–3747, 2012.	NeuroImage	2012	6,252	5-10
6	MOD	S.F. Eskildsen, P. Coupé, V. Fonov, J.C. Pruessner, D. L. Collins. Structural imaging biomarkers of Alzheimer's disease: predicting disease progression. Neurobiology of Aging, Accepted, 2014	Neurobiology of Aging	2014	6,166	5-10
6	MOD	S. Hu, P. Coupé, J.C. Pruessner, D. L. Collins. Nonlocal Regularization for Active Appearance Model: Application to medial Temporal Lobe Segmentation. Human brain mapping 35(2): 377-395, 2014.	Human brain mapping	2014	5,88	5-10
6	MOD	Thureau S., Chaumet-Riffaud P., Modzelewski R., Fernandez P., Tessonnier L., Vervueren L., Cachin F., Berriolo-Riedinger A., Olivier P., Kolesnikov-Gautier H., Blagosklonov O., Bridji B., Devillers A., Collombier L., Courbon F., Gremillet E., Houzard C., Caignon J.M., Roux J., Aide N., Brenot-Rossi I., Doyeux K., Dubray B., Vera P. (2013): Interobserver Agreement of Qualitative Analysis and Tumor Delineation of FMISO and FLT PET-images in Lung Cancer. J. Nucl. Med., 54(9):1543-50.	J. Nucl. Med	2013	5,774	5-10
6	MOD	Fayad H., Lamare F., Cheze Le Rest C., Bettinardi V., Visvikis D.(2013): Generation of 4-Dimensional CT Images Based on 4-Dimensional PET-Derived Motion Fields, J Nucl Med., 54(4) : 631-638.	J. Nucl. Med	2013	5,774	5-10
6	MOD	Hatt, M., Groheux, D., Martineau, A., Espie, M., Hindie, E., Giacchetti, S., de Roquancourt, A., Visvikis, D., Cheze-Le Rest, C. (2013): Comparison between 18F-FDG PET image-derived indices for early prediction of response to neoadjuvant chemotherapy in breast cancer. J Nucl Med. 54, 341-9.	J Nucl Med.	2013	5,774	5-10
6	CRYOIMMUNO	Cornelis F, Silk M, Schoder H, Takaki H, Durack J, Erinjeri J, Sofocleous C, Siegelbaum R, Maybody M, Solomon S. Performance of intra-procedural 18-Fluorodeoxyglucose PET/CT guided biopsies for lesions suspected of malignancy but poorly visualized with other modalities. Eur J Nucl Med Mol Imaging. 2014 Aug 9. [Epub ahead of print]	Eur J Nucl Med Mol Imaging	2014	5,217	5-10

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
6	MOD	Fayad H, Le Pogam A, Lamare F, Fernandez P, Pradier O, Valette G, Visvikis D, Cheze Le Rest C. (2014): Influence of partial volume correction in staging of head and neck squamous cell carcinoma using PET/CT. Q J Nucl Med Mol Imaging. 58(3):319-28.	J Nucl Med Mol Imaging	2014	5,036	5-10
6	MOD	Groheux, D., Hatt, M., Hindie, E., Giacchetti, S., de Cremoux, P., Lehmann-Che, J., Martineau, A., Marty, M., Cuvier, C., Cheze-Le Rest, C., de Roquancourt, A., Visvikis, D., Espie, M. (2013): Estrogen receptor-positive/human epidermal growth factor receptor 2-negative breast tumors: early prediction of chemosensitivity with 18F-fluorodeoxyglucose positron emission tomography/computed tomography during neoadjuvant chemotherapy. Cancer. 119, 1960-8.	Cancer	2013	4,901	<5
6	CRYOIMMUNO	Cornelis F, Truchetet ME, Amoretti N, Verdier D, Fournier C, Pillet O, Gille O, Hauger O. Bisphosphonate therapy for unresectable symptomatic benign bone tumors: A long-term prospective study of tolerance and efficacy. Bone. 2014;58(1):11-16.	Bone	2014	4,461	<5
6	MOD	Stemkens B, Tijssen R, Denis de Senneville B, Lagendijk J, van den Berg C, Retrospective Reconstruction of 3D Radial MRI Data to Evaluate the Effect of Abdominal Compression On 4D Abdominal Organ Motion, International Journal of Radiation Oncology Biology Physics, 2014, In press. (IF: 4.176)	International Journal of Radiation Oncology Biology Physics	2014	4,176	<5
6	MOD	P. Coupé, M. Munz, J. V. Manjon, E. Ruthazer, D. L. Collins. A CANDLE for a deeper in vivo insight. Medical Image Analysis, 16 (4):849-864, 2012.	Medical Image Analysis	2012	4,087	<5
6	MOD	J. V. Manjon, P. Coupé, A. Buades, D. L. Collins, M. Robles. New Methods for MRI Denoising based on Sparseness and Self-Similarity. Medical Image Analysis, 16(1): 18-27, 2012.	Medical Image Analysis	2012	4,087	<5
6	MOD	Denis de Senneville B, Roujol S, Hey S, Moonen C T W, Ries M, Extended Kalman Filtering for continuous volumetric MR-Temperature Imaging, IEEE Trans on Med Imaging, 2013;32(4):711-718. (IF: 3.643)	IEEE Trans on Med Imaging	2013	4,03	<5
6	MOD	David, S., Visvikis D., Quellec G., Chez-Lerest, C., Fernandez, P., Allard, M., Roux, C., Hatt, M. (2012): Image change detection using paradoxical theory for patient follow-up quantitation and therapy assessment. IEEE T Med Imaging. 31(9), 1743-1753.	IEEE T Med Imaging	2012	4,03	<5
6	CRYOIMMUNO	Cornélis F, Belleannée G, Lederlin M. Cardiac extension of an intravascular leiomyomatosis 43 years after hysterectomy. J Thorac Cardiovasc Surg. 2012 Jul;144(1):e3-5.	J Thorac Cardiovasc Surg	2012	3,991	<5
6	MOD	J. V. Manjon, P. Coupé, L. Concha, A. Buades, D. L. Collins, M. Robles. Diffusion Weighted Image Denoising using overcomplete Local PCA. PLoS ONE 8(9): e73021. doi:10.1371/journal.pone.0073021.	PLoS ONE	2013	3,73	<5
6	COBRASCAN	Lederlin M, Ozier A, Dournes G, Ousova O, Girodet PO, Begueret H, Marthan R, Montaudon M, Laurent F, Berger P. In-vitro Micro-CT Assessment of airway Remodeling in Flexible OVA-Sensitized Murine Model of Asthma. PLoS One. 2012;7(10) Epub 2012 Oct 30	PLoS One	2012	3,73	<5
6	MOD	Lorenzato C, Oerlemans C, Cernicanu A, Ries M, Denis de Senneville B, Moonen C T W, Bos C, Rapid Dynamic Temperature/R1/R2* Assessment: A Method With Potential For Monitoring Drug Delivery, Nuclear Magnetic Resonance in Biomedicine, 2014, In press. (IF: 3.214)	NMR Biomed	2014	3,559	<5
6	MOD	Hey S, Cernicanu A, Denis de Senneville B, Roujol S, Ries M, Jaïs P, Moonen C T W, Quesson B, Towards Optimized MR Thermometry of the Human Heart at 3T, Nuclear Magnetic Resonance in Biomedicine, 2012;25(1):35-43. (IF: 3.214)	NMR Biomed	2012	3,559	<5
6	MOD	Lamare F,Mazere J,Attila M,Mayo W,De Clermont-Gallerande H,Meissner W,Fernandez P,Allard M, Improvement of in vivo quantification of [123I]-Iodobenzovesamicol in single-photon emission computed tomography/computed tomography using anatomic image to brain atlas nonrigid registration. Mol Imaging. 2013 Jul-Aug;12(5):288-99.	Mol Imaging	2013	3,408	<5
6	MOD	Lamare F., Mazere J., Attila M., De Clermont-Gallerande H., Fernandez F., Allard M. (2013): Improvement of in vivo quantification of [123I]-Iodobenzovesamicol in single-photon emission computed tomography/computed tomography using anatomic image to brain atlas nonrigid registration. Molecular imaging., 12(5):288-99.	Molecular imaging	2013	3,408	<5
6	MOD	Derieppe M, Denis de Senneville B, Kuijf H, Moonen C T W, Bos C, Tracking of Cell Nuclei for Assessment of In Vitro Uptake Kinetics in Ultrasound-Mediated Drug Delivery using Fibered Confocal Fluorescence Microscopy, Molecular Imaging and Biology, 2014;16(5):642-651. (IF: 3.844)	Molecular Imaging and Biology	2014	3,1	<5
6	MOD	Derieppe M, Yudina A, Lepetit-Coiffé M, Denis de Senneville B, Bos C, Moonen C T W, Real-Time Assessment of Ultrasound-Mediated Drug Delivery Using Fibered Confocal Fluorescence Microscopy, Molecular Imaging and Biology, 2013;15(1):3-11. (IF: 3.844)	Molecular Imaging and Biology	2013	3,1	<5
6	MOD	Lamare F, Lemaitre A, Fernandez P, Rimoldi OE, Visvikis D. (2014): Evaluation of respiratory and cardiac motion correction schemes in dual gated PET/CT cadiac imaging. Med. Phys. 41(7):072504.	Med. Phys	2014	3,012	<5
6	CRYOIMMUNO	Cornelis F, Lasserre AS, Tourdias T, Deminière C, Ferrière JM, Le Bras Y, Grenier N. Combined late gadolinium-enhanced and double-echo chemical-shift MRI help to differentiate renal oncocytomas with high central T2 signal intensity from renal cell carcinomas. AJR Am J Roentgenol. 2013 Apr;200(4):830-8.	AJR Am J Roentgenol	2013	2,9	<5
6	COBRASCAN	Lederlin M, Laurent F, Portron Y, Ozier A, Cochet H, Berger P, Montaudon M. Mean bronchial wall attenuation value in chronic obstructive pulmonary disease: comparison with standard bronchial parameters and correlation with function. AJR Am J Roentgenol 2012;198:800-808	AJR Am J Roentgenol	2012	2,9	<5
6	COBRASCAN	Lederlin M, Laurent F, Portron Y, Ozier A, Cochet H, Berger P, Montaudon M. CT attenuation of the bronchial wall in patients with asthma: comparison with geometric parameters and correlation with function and histologic characteristics. AJR Am J Roentgenol. 2012 Dec;199(6):1226-33.	AJR Am J Roentgenol	2012	2,9	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
6	MOD	Lorenzato C, Cernicanu A, Meyre M. E,Germain M, Pottier A,Levy L, Denis de Senneville B, Bos C, Moonen C T W, Smirnov P, MRI contrast variation of thermosensitive magnetoliposomes triggered by focused ultrasound: a tool for image guided local drug delivery, Contrast Media and Molecular Imaging, 2013;8(2):185-192. (IF: 3.328)	Contrast Media and Molecular Imaging	2013	2,872	<5
6	CRYOIMMUNO	Sargos P, Ferretti L, Gross-Goupil M, Cornelis F et al. Characterization of prostate neuroendocrine cancers and therapeutic management: a literature review. Prostate Cancer and Prostatic Diseases. 2014 May 6. [Epub ahead of print]	Prostate Cancer and Prostatic Diseases	2014	2,83	<5
6	MOD	Henriques de Figueiredo B,Zacharatou C,Galland-Girodet S,Benech J,De Clermont-Gallerande H,Lamare F,Hatt M,Digue L,De Mones Del Pujol E,Fernandez P, Hypoxia imaging with [18F]-FMISO-PET for guided dose escalation with intensity-modulated radiotherapy in head-and-neck cancers. Strahlenther Onkol. 2014 Sep 23.	Strahlenther Onkol	2014	2,733	<5
6	MOD	Henriques de Figueiredo B,Merlin T,de Clermont-Gallerande H,Hatt M,Vimont D,Fernandez P,Lamare F, Potential of [18F]-fluoromisonidazole positron-emission tomography for radiotherapy planning in head and neck squamous cell carcinomas. Strahlenther Onkol. 2013 Dec;189(12):1015-9.	Strahlenther Onkol	2013	2,733	<5
6	MOD	Laffon E,Lamare F,de Clermont H,Burger IA,Marthan R, Variability of average SUV from several hottest voxels is lower than that of SUVmax and SUVpeak. Eur Radiol. 2014 Aug;24(8):1964-70.	Eur Radiol	2014	2,512	<5
6	MOD	Laffon E,de Clermont H,Marthan R, Variability of ^{18}F-FDG-positive lung lesion volume by thresholding. Eur Radiol. 2013 Apr;23(4):1131-7.	Eur Radiol	2013	2,512	<5
6	CRYOIMMUNO	Amoretti N, Bertrand AS, Gallo G, Caudal A, Cornelis F, Hauger O, Boileau P.Percutaneous consolidation of loosened spine arthrodesis under CT and fluoroscopy guidance by radiologists: a new useful technique. Eur Radiol. 2014 Oct 31. [Epub ahead of print]	Eur Radiol	2014	2,512	<5
6	CRYOIMMUNO	Cornelis F, Tricaud E, Lasserre AS, Petitpierre F, Bernhard JC, Le Bras Y, Yacoub M, Bouzgarrou M, Ravaud A, Grenier N. Multiparametric Magnetic Resonance Imaging for Differentiating Low and High-Grade Clear-Cell Renal Carcinoma. Eur Radiol. 2014 Aug 14. [Epub ahead of print]	Eur Radiol	2014	2,512	<5
6	CRYOIMMUNO	Hocquelet A, Cornelis F, Le Bras Y, Meyer M, Tricaud E, Lasserre AS, Ferrière JM, Robert G, Grenier N. Long-term results of preventive embolization of renal angiomyolipomas: evaluation of predictive factors of volume decrease. Eur Radiol. 2014 Aug;24(8):1785-93.	Eur Radiol	2014	2,512	<5
6	CRYOIMMUNO	Cornelis F, Tricaud E, Lasserre AS, Petitpierre F, Bernhard JC, Le Bras Y, Yacoub M, Bouzgarrou M, Ravaud A, Grenier N. Routinely performed multiparametric magnetic resonance imaging helps to differentiate common subtypes of renaltumours. Eur Radiol. 2014 May;24(5):1068-1080	Eur Radiol	2014	2,512	<5
6	CRYOIMMUNO	Balageas P, Cornelis F, Le Bras Y, Hubrecht R, Bernhard JC, Ferrière JM, Ravaud A, Grenier N. Ten-year experience of percutaneous image-guided radiofrequency ablation of malignant renal tumours in high-risk patients. Eur Radiol. 2013 Jul;23(7):1925-32.	Eur Radiol	2013	2,512	<5
6	COBRASCAN	Dournes G, Verdier D, Montaudon M, Bullier E, Rivière A, Dromer C, Picard F, Billes MA, Corneloup O, Laurent F, Lederlin M. Dual-energy CT perfusion and angiography in chronic thromboembolic pulmonary hypertension: diagnostic accuracy and concordance with radionuclide scintigraphy.Eur Radiol. 2013 Aug 28. [Epub ahead of print] PMID: 23982287[PubMed - as supplied by publisher]	Eur Radiol	2013	2,512	<5
6	COBRASCAN	Dournes G, Laurent F. Airway Remodelling in Asthma and COPD: Findings, Similarities, and Differences Using Quantitative CT. Pulm Med 2012;2012:670414	Pulm Med	2012	2,49	<5
6	MOD	Laffon E,de Clermont H,Lamare F,Marthan R, Estimating the amount of FDG uptake in physiological tissues. Nucl Med Biol. 2014 Oct;41(9):717-20.	Nucl Med Biol	2014	2,458	<5
6	CRYOIMMUNO	Cornelis F, Havez M, Labrèze C, Taieb A, Bui BN, Midy D, Grenier N. Percutaneous cryoablation of symptomatic localized venous malformations: preliminary short-term results. J Vasc Interv Radiol. 2013 Jun;24(6):823-7.	J Vasc Interv Radiol	2013	2,149	<5
6	CRYOIMMUNO	Cornelis F, Havez M, Le Bras Y, Descat E, Richaud P, Grenier N. Salvage CT-guided transgluteal cryoablation for locally recurrent prostate cancer: initial experiences. J Vasc Interv Radiol. 2013 May;24(5):685-9.	J Vasc Interv Radiol	2013	2,149	<5
6	CRYOIMMUNO	Cornelis F, Italiano A, Al-Ammari S, Kind M, Stoeckle E, Gangi A, Palussière J, Bui BN. Successful iterative percutaneous cryoablation of multiple extraabdominal desmoid tumors in a patient with Gardner syndrome. J Vasc Interv Radiol. 2012 Aug;23(8):1101-3.	J Vasc Interv Radiol	2012	2,149	<5
6	MOD	Roujol S, Benois-Pineau J, Denis de Senneville B, Ries M, Quesson B, Moonen C T W, Robust real time constrained estimation of respiratory motion for interventional MRI on mobile organs, IEEE Transactions on Information Theory in Biomedicine, 2012;365-374. (IF: 1,676)	IEEE Transactions on Information Theory in Biomedicine	2012	2,072	<5
6	MOD	Roujol S, Denis de Senneville B, Hey S, Moonen C T W, Ries M, Robust adaptive extended Kalman filtering for real time MR-thermometry guided HIFU interventions, IEEE Transaction on Medical Imaging, 2012;31(3):533-42. (IF: 3.643)	IEEE Transactions on Information Theory in Biomedicine	2012	2,072	<5
6	CRYOIMMUNO	Cornelis F, et al. Comparison of Manual and CT-Guided Robotic Positioning System for In-Vivo Needle Placements in Swine Liver. CVIR In Press	CVIR	2014	1,965	<5
6	CRYOIMMUNO	Cornelis F, Paty P, Sofocleous C, Solomon S, Durack J. Percutaneous cryoablation for local control of metachronous inguinal lymph node metastases. CVIR. 2014 Jul 1. [Epub ahead of print]	CVIR	2014	1,965	<5
6	CRYOIMMUNO	Cornelis F, Petitpierre F, Lasserre AS, Tricaud E, Dallaudière B, Stoeckle E, Le Bras Y, Bouzgarrou M, Brun JL, Grenier N. Percutaneous cryoablation of symptomatic abdominal scar endometrioma: initial reports. CVIR 2014. 2014 Jan 25. [Epub ahead of print]	CVIR	2014	1,965	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
6	CRYOIMMUNO	Havez M, Lippa N, Al-Ammari S, Kind M, Stoeckle E, Italiano A, Gangi A, Hauger O, Cornelis F. Percutaneous image-guided cryoablation in inoperable extra-abdominal desmoid tumors: a study of tolerability and efficacy. CVIR 2014. 2014 Jan 9. [Epub ahead of print]	CVIR	2014	1,965	<5
6	CRYOIMMUNO	Cornelis F, Neuville A, Labrèze C, Kind M, Bui B, Midy D, Palussière J, Grenier N. Percutaneous cryotherapy of vascular malformation: initial experience. Cardiovasc Intervent Radiol. 2013 Jun;36(3):853-6.	Cardiovasc Intervent Radiol	2013	1,965	<5
6	CRYOIMMUNO	Palussière J, Canella M, Cornelis F, Catena V, Descat E, Brouste V, Montaudon M. Retrospective review of thoracic neural damage during lung ablation - what the interventional radiologist needs to know about neural thoracic anatomy. Cardiovasc Intervent Radiol. 2013 Apr 11. [Epub ahead of print]	Cardiovasc Intervent Radiol	2013	1,965	<5
6	CRYOIMMUNO	Sargos P, Ferretti L, Henriques de Figueiredo B, Cornelis F, Belhomme S, Dallaudière B, Richaud P. [Radiotherapy after testicular-sparing surgery for bilateral or monorchide testicular tumours: an innovative approach]. Cancer Radiother. 2013 Jul-Aug;17(4):317-22.	Cancer Radiother	2013	1,477	<5
6	CRYOIMMUNO	Palussière J, Descat E, Cornélis F. [Is there a curative treatment for oligometastases? Lung radiofrequency ablation]. Cancer Radiother. 2012 Sep;16(5-6):348-50.	Cancer Radiother	2012	1,477	<5
6	MOD	Le Pogam A., Lamare F., Hatt M., Fernandez P., Cheze Le Rest C., Visvikis D.(2013): MRI data driven partial volume effects correction in PET imaging using 3D local multi-resolution analysis, Nuclear Instruments and Methods in Physics Research Section A : Accelerators, Spectrometers, Detectors and Associated Equipment, 702 : 39-41.	Nuclear Instruments and Methods in Physics Research	2013	1,316	<5
6	MOD	Th. Colin, H. Fathallah, J.-B. Lagaert, O. Saut, A Multilayer Grow-or-Go Model for GBM: Effects of Invasive Cells and Anti-Angiogenesis on Growth. To appear in Bulletin of Mathematical Biology.	Bulletin of Mathematical Biology.	2014	1,292	<5
6	MOD	F. Cornelis, O. Saut, P. Cumsille, D. Lombardi, A. Iollo, J. Palussiere, T. Colin, In vivo mathematical modeling of tumor growth from imaging data : soon to come in the future ? Diagnostic and Interventional Imaging, Vol 94, Issue 6, Pages 571-574 (June 2013).	Diagnostic and Interventional Imaging	2013	1,03	<5
6	CRYOIMMUNO	Lippa N, Sargos P, Italiano A, Kind M, Dallaudière B, Hauger O, Cornelis F. Standardization of selection criteria for percutaneous image-guided cryoablation of recurrent soft-tissue sarcomas. Diagn Interv Imaging. 2014 Mar 14. [Epub ahead of print]	Diagn Interv Imaging	2014	1,03	<5
6	CRYOIMMUNO	Dallaudière B, Lincot J, Hess A, Balbi V, Cornelis F, Larbi A, Laissy JP, Cotten A, Schouman-Claeys E. Clinical relevance of diffusion tensor imaging parameters in lumbar disco-radicular conflict. Diagn Interv Imaging. 2014 Jan;95(1):63-8.	Diagn Interv Imaging	2014	1,03	<5
6	CRYOIMMUNO	Grenier N, Cornelis F, Le Bras Y, Rigou G, Boutault JR, Bouzgarrou M. Perfusion imaging in renal diseases. Diagn Interv Imaging. 2013 Oct 14.	Diagn Interv Imaging	2013	1,03	<5
6	CRYOIMMUNO	Cornelis F, Saut O, Cumsille P, Lombardi D, Iollo A, Palussiere J, Colin T. In vivo mathematical modeling of tumor growth from imaging data: soon to come in the future? Diagn Interv Imaging. 2013 Jun;94(6):593-600.	Diagn Interv Imaging	2013	1,03	<5
6	CRYOIMMUNO	Grenier N, Gennisson JL, Cornelis F, Le Bras Y, Couzi L. Renal ultrasound elastography. Diagn Interv Imaging. 2013 May;94(5):545-50.	Diagn Interv Imaging	2013	1,03	<5
6	CRYOIMMUNO	Cornelis F, Havez M, Lippa N, Al-Ammari S, Verdier D, Carteret T, Amoretti N, Gangi A, Palussiere J, Hauger O, Grenier N. Radiologically guided percutaneous cryotherapy for soft tissue tumours: A promising treatment. Diagn Interv Imaging. 2013 Apr;94(4):364-70.	Diagn Interv Imaging	2013	1,03	<5
6	CRYOIMMUNO	Palussière J, Pellerin-Guignard A, Descat E, Cornélis F, Dixmérias F. Radiofrequency ablation of bone tumours. Diagn Interv Imaging. 2012 Sep;93(9):660-4.	Diagn Interv Imaging	2013	1,03	<5
6	CRYOIMMUNO	Cornelis F, Balageas P, Le Bras Y, Rigou G, Boutault JR, Bouzgarrou M, Grenier N. Radiologically-guided thermal ablation of renal tumours. Diagn Interv Imaging. 2012 Apr;93(4):246-61.	Diagn Interv Imaging	2012	1,03	<5
6	MOD	T. Colin, A. Iollo, D. Lombardi, O. Saut System Identification in Tumor Growth Modeling Using Semi-empirical Eigenfunctions. Math. Models Methods Appl. Sci. 22, 1250003 (2012).	Math. Models Methods Appl. Sci.	2012	0,877	<5
6	MOD	Cornelis F,de Clermont H,Bernhard JC,Ravaud A,Grenier N, Quantitative imaging in uro-oncology, Prog Urol. 2014 Jun;24(7):399-413.	Prog Urol.	2014	0,8	<5
6	CRYOIMMUNO	Cornelis F, De Clermont H, Ravaud A, Grenier N. L'imagerie d'évaluation thérapeutique en pratique clinique d'oncologie urologique. Prog Urol. 2014 Jun;24(7):399-413.	Prog Urol	2014	0,8	<5
6	MOD	C. Haegelen, P Coupé, V. Fonov, N. Guizard, P. Jannin, X. Morandi, D. L. Collins. Automated segmentation of basal ganglia and deep brain structures in MRI of Parkinson's disease . IJCARS, 8(1):99-110, 2013.	IJCARS	2013	0,791	<5
6	MOD	S. J.-S. Chen, I. Reinertsen, P. Coupé, C. XB Yan, L. Mercier, D R. Del Maestro, D L. Collins. Validation of a hybrid Doppler ultrasound vessel-based registration algorithm for neurosurgery. IJCARS, 7(5):667-685, 2012.	IJCARS	2012	0,791	<5
6	MOD	P. Coupé, J. V Manjon, M. Robles, D. L. Collins. Adaptive multiresolution non-local means filter for three-dimensional magnetic resonance image denoising. IET Image Processing, 6(5): 558-568, 2012.	IET Image Processing	2012	0,676	<5
6	MOD	Th. Colin, A. Iollo, J.-B. Lagaert and O. Saut, An inverse problem for the recovery of the vascularization of a tumor. To appear in Journal of Inverse and Ill-posed problems. 2014	Journal of Inverse and Ill-posed problems	2014	0,593	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
7	ABACI	Bis JC, Decarli C, Smith AV, van der Lijn F, Crivello F, Fornage M, Debette S, Shulman JM, Schmidt H, Srikanth V, Schuur M, Yu L, Choi SH, Sigurdsson S, Verhaaren BF, Destefano AL, Lambert JC, Jack CR Jr, Struchalin M, Stankovich J, Ibrahim-Verbaas CA, Fleischman D, Zijdenbos A, den Heijer T, Mazoyer B, Coker LH, Enzinger C, Danoy P, Amin N, Arfanakis K, van Buchem MA, de Bruijn RF, Beiser A, Dufouil C, Huang J, Cavalieri M, Thomson R, Niessen WJ, Chibnik LB, Gislason GK, Hofman A, Pikula A, Amouyel P, Freeman KB, Phan TG, Oostra BA, Stein JL, Medland SE, Vasquez AA, Hibar DP, Wright MJ, Franke B, Martin NG, Thompson PM; the Cohorts for Heart and Aging Research in Genomic Epidemiology (CHARGE) Consortium, Nalls MA, Uitterlinden AG, Au R, Elbaz A, Beare RJ, van Swieten JC, Lopez OL, Harris TB, Chouraki V, Breteler MM, De Jager PL, Becker JT, Vernooij MW, Knopman D, Fazekas F, Wolf PA, van der Lugt A, Gudnason V, Longstreth WT Jr, Brown MA, Bennett DA, van Duijn CM, Mosley TH, Schmidt R, Tzourio C, Launer LJ, Ikram MA, Seshadri S. (2012). Common variants at 12q14 and 12q24 are associated with hippocampal volume. Nature Genetics 54 5:545-551 (2012 De Leon Prize)	nature genetics	2012	35,209	>10
7	ABACI	Samieri C, Maillard P, Crivello F, Proust-Lima C, Peuchant E, Helmer C, Amieva H, Allard M, Dartigues JF, Cunnane S, Mazoyer B, Baberger-Gateau P (2012) Plasma long-chain omega-3 fatty acids and atrophy of the medial temporal lobe. Neurology 79:642-650.	Neurology	2012	8,25	5-10
7	ABACI	Satizabal CL, Zhu YC, Mazoyer B, DufouilC, Tzourio C (2012) Circulating IL6 and CRP are associated with MRI findings in the elderly. The 3C Study. Neurology 78:720-727.	Neurology	2012	8,25	5-10
7	ABACI	Brisset M, Boutouyrie P, Pico F, Zhu YC, Zureik M, Dufouil C, Mazoyer B, Laurent S, Tzourio C, Debette S (2013) Large Vessel Correlates of Cerebral Small Vessel Disease. Neurology 80:662-669.	Neurology	2013	8,25	5-10
7	ABACI	Schilling S, DeStefano AL, Sachdev PS, Choi SH, Mather KA, DeCarli CD, Wen W, Høgh P, Raz N, Au R, Beiser A, Wolf PA, Romero JR, Zhu YC, Lunetta KL, Farrer L, Dufouil C, Kuller LH, Mazoyer B, Seshadri S, Tzourio C, Debette S (2013) APOE genotype and MRI-markers of cerebrovascular disease: A systematic review and meta-analysis. Neurology 81:292-300.	Neurology	2013	8,25	5-10
7	ABACI	Elbaz A, Vicente-Vytopilova P, Tavernier B, Sabia S, Dumurgier J, Mazoyer B, Singh-Manoux A, Tzourio C (2013) Motor function in the elderly: evidence for the reserve hypothesis. Neurology 81:417-426.	Neurology	2013	8,25	5-10
7	ABACI	Kaffashian S, Tzourio C, Soumare A, Dufouil C, Crivello F, Zhu Y, Schraen-Maschke S, Mazoyer B, Buee L, Debette S (2014) Association of Plasma A-Levels with MRI Markers of Cerebral Small Vessel Disease. Neurology (in press april 2014)	Neurology	2014	8,25	5-10
7	ABACI	Schilling S, Tzourio C, Dufouil C, Zhu Y, Berr C, Alperovitch A, Crivello F, Mazoyer B, Debette S (2014) Plasmalipids and cerebral small vessel disease. Neurology (in press august 2014)	Neurology	2014	8,25	5-10
7	ABACI	Schilling S, Tzourio C, Dufouil C, Zhu Y, Berr C, Alperovitch A, Crivello F, Mazoyer B, Debette S (2014) Plasmalipids and cerebral small vessel disease. American Academy of Neurology, 2014. Neurology 82 (10): S40.002	Neurology	2014	8,25	5-10
7	ABACI	Kaffashian S, Tzourio C, Soumare A, Dufouil C, Crivello F, Zhu Y, Schraen-Maschke S, Mazoyer B, Buee L, Debette S (2014) Association of Plasma A- Levels with MRI Markers of Cerebral Small Vessel Disease. American Academy of Neurology, 2014. Neurology 82 (10): S38.005.	Neurology	2014	8,25	5-10
7	ABACI	Marie D, Jobard G, Crivello F, Petit L, Perchey G, Mellet E, Joliot M, Zago L, Mazoyer B, Tzourio-Mazoyer N (2014) Descriptive anatomy of Heschl's gyrus in 430 healthy volunteers including 198 left-handers. Brain Structure and Function (epub December 6)	Brain Structure and Function	2014	7,837	5-10
7	ABACI	zourio-Mazoyer N, Marie D, Zago L, Perchey G, Leroux G, Mellet E, Jobard G, Joliot M, Crivello F, Petit L, Mazoyer B (2014) Heschl's gyrification pattern is related to speech listening hemispheric lateralization fMRI investigation in 281 healthy volunteers. Brain Structure and Function (epub March 18)	Brain Structure and Function	2014	7,837	5-10
7	ABACI	Doucet G, Naveau M, Petit L, Zago L, Crivello F, Jobard G, Mellet E, Tzourio-Mazoyer N, Mazoyer B, and Joliot M (2012) Patterns of hemodynamic low-frequency oscillations in the brain are modulated by the nature of free thoughts during rest. Neuroimage 59:3194-3200. (2012 Neuroimage Best paper award)	Neuroimage	2012	6,25	5-10
7	ABACI	Dumurgier J, Crivello F, Mazoyer B, Ahmed I, Tavernier B, Grabli D, François C, Tzourio-Mazoyer N, Tzourio C, Elbaz A (2012) MRI atrophy of the caudate nucleus and slower walking speed in the elderly. Neuroimage 60:871-878.	Neuroimage	2012	6,25	5-10
7	ABACI	Debette S, Wolf C, Lambert JC, Crivello F, Soumaré A, Schilling S, Dufouil C, Mazoyer B, Amouyel P, Tzourio C, Elbaz A (2014) Abdominal obesity is associated with lower gray matter volume: a Mendelian randomization study. Neurobiology of Aging 35:378-386.	Neurobiology of Aging	2014	6,166	5-10
7	ABACI	Yao M, Zhu Y, Soumaré A, Dufouil C, Mazoyer B, Tzourio C, Chabriat H (2014) Hippocampal perivascular spaces are associated with aging and blood pressure but not with cognition. NeuroBiology of Aging 35 :2118-2125.	NeuroBiology of Aging	2014	6,166	5-10
7	ABACI	Elbejjani M, Fuhrer R, Abrahamowicz M, Mazoyer B, Crivello F, Tzourio C, Dufouil C (2013) Hippocampal changes and subsequent depressive symptoms in a community-based sample of older adults. American Journal of Epidemiology 177, sup. 11: S91.	American Journal of Epidemiology	2013	4,975	<5
7	ABACI	Elbejjani M, Fuhrer R, Abrahamowicz M, Mazoyer B, Crivello F, Tzourio C, Dufouil C (2014) Hippocampal atrophy and subsequent depressive symptoms in older men and women: Results from a ten-year prospective cohort. American Journal of Epidemiology 180:385-393.	American Journal of Epidemiology	2014	4,975	<5
7	ABACI	Elbejani , Fuhrer R, Mazoyer B, Crivello F, Tzourio C, Dufouil C (2011) Hippocampal volume and depressive symptoms in a cohort of older adults. American Journal of Epidemiology 173 :S159.	American Journal of Epidemiology	2011	4,975	<5

WP	Research theme	Publication	Journal	Year	Impact Factor	IF Rank
7	ABACI	Collin C, Revera M, Laurent S, Mazoyer B, Tzourio C, Boutouryie P, Dufouil C (2011) Elevated aortic pulse wave velocity is associated with higher risk of extended periventricular white matter lesions in elder males. Journal of hypertension 28:E34.	Journal of hypertension	2011	4,222	<5
7	ABACI	Mazoyer B, Zago L, Jobard G, Petit L, Crivello F, Mellet E, Joliot M, Tzourio-Mazoyer N (2014) Revisiting the association between handedness and lateralization for language. PLOS One 9(6):e101165.	Plos One	2014	3,73	<5
7	ABACI	Mellet E, Zago L, Jobard G, Crivello F, Petit, L, Joliot M, Mazoyer B, Tzourio Mazoyer N (2014) A weak language lateralization affects both verbal and spatial skills: an fMRI study in 297 subjects. Neuropsychologia 65 :56-62.	Neuropsychologia	2014	3,451	<5
7	ABACI	Naveau M, Doucet G, Delcroix N, Petit L, Zago L, Crivello F, Jobard G, Mellet E, Tzourio-Mazoyer N, Mazoyer B, and Joliot M (2012) A novel group ICA approach based on multi-scale individual component clustering. Application to a large sample of fMRI data. Neuroinformatics 10:269-285.	Neuroinformatics	2012	3,102	<5
7	ABACI	Duriez Q, Crivello F, Mazoyer B (2014) Sex-related and tissue-specific effects of tobacco smoking on brain atrophy: assessment in a large longitudinal cohort of healthy elderly. Frontiers in Aging Neuroscience (in press)	Frontiers in Aging Neuroscience	2014	2,8	<5
7	ABACI	Rist PM, Tzourio C, Elbaz A, Soumare A, Dufouil C, Mazoyer B, Kurth T (2014) Structural Brain Lesions and Restless Legs Syndrome: A cross-sectional population-based study. BMJ Open (in press august 2014).	BMJ Open	2014	2,063	<5
7	ABACI	Mellet E, Jobard G, Zago L, Crivello F, Petit, L, Joliot M, Mazoyer B, Tzourio Mazoyer N (2014) Effect of hand laterality on verbal and spatial skills in 436 healthy adults balanced for handedness. Laterality 19:4 383-404.	Laterality	2014	1,312	<5
5	MIMATHUMAB	Kamel Deramchia, Marie-Josée Jacobin-Valat, Jeanny Laroche-Traineau, Stéphane Bonetto, Stéphane Sanchez, Pierre Dos Santos, Philippe Massot, Jean-Michel Franconi, Pierre Martineau, Gisèle Clofent-Sanchez. By-passing large screening experiments using sequencing as a tool to identify scFv fragments targeting atherosclerotic lesions in a novel in vivo phage display selection. Int J Mol Sci. 2012;13(6):6902-23.	International Journal of Molecular Sciences	2012	2,339	<5
5	MIMATHUMAB	Kamel Deramchia, Marie-Josée Jacobin-Valat, Amélie Vallet, Hervé Bazin, Xavier Santarelli, Stéphane Sanchez, Pierre Dos Santos, Jean-Michel Franconi, Stéphane Claverol, Stéphane Bonetto and Gisèle Clofent-Sanchez. New human antibody fragments homing to atherosclerotic endothelial and subendothelial tissues: an in vivo phage display targeting. Am J Pathol. 2012 Jun; 180(6): 2576-89.	Am J Pathol.	2012	4,602	<5
5	MIMATHUMAB	Boris Garnier, Sisareuth Tan, Céline Gounou, Jeanny Laroche-Traineau, Marie-Josée Jacobin-Valat, Gisèle Clofent-Sanchez, Alain R. Brisson. Development of a platform of antibody-presenting liposomes. Biointerphases 2012 Dec;7(1-4):11.	Atherosclerosis	2012	3,971	<5
5	MIMATHUMAB	Boris Garnier, Sisareuth Tan, Céline Gounou, Jeanny Laroche-Traineau, Marie-Josée Jacobin-Valat, Gisèle Clofent-Sanchez, Alain R. Brisson. Development of a platform of antibody-presenting liposomes. Biointerphases 2012 Dec;7(1-4):11.	Biointerphases	2012	1,91	<5

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WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
1	MRGHIFU	Pinel K, Debeissat C, Genevois C & Couillaud F. Optical imaging of thermo-induced gene silencing in tumors. Word Congress of Molecular Imaging. Dublin, Irland, 2012.	Word Congress of Molecular Imaging	2012	Dublin	Irland	International
1	MRGHIFU	De la Rosa X, Santalucia T, Fortin P-Y, Purroy J, Calvo M, Salas A, Justicia C, Couillaud F & Planas A M. In vivo imaging heat schok protein-70 induction after brain ischemia with a far red fluorescent reporter mouse. Word Congress of Molecular Imaging. Dublin, Irland, 2012.	Word Congress of Molecular Imaging	2012	Dublin	Irland	International
1	MRGHIFU	Pinel K, Debeissat C, Genevois C & Couillaud F. Contrôle spatio-temporel de l'inhibition génique in vivo. Cancéropole Grand Sud-Ouest. Montpellier, France, 2012.	Canceropole GSO	2012	Montpellier	France	France
1	MRGHIFU	Fortin P-Y, Chapolard M, Genevois C & Couillaud F. Imagerie in vivo de l'activation transitoire d'un promoteur. Cancéropole Grand Sud-Ouest. Montpellier, France, 2012.	Canceropole GSO	2012	Montpellier	France	France
1	MRGHIFU	Emilien A, Benois-Pineau J, Elbes D, Quesson B. Adaptive rejection of outliers for robust motion compensation in cardiac MR-thermometry, IEEE International Conference on Image Processing (ICIP), 2013.	IEEE International Conference on Image Processing	2013	Melbourne	Australia	International
1	MRGHIFU	Elbes D, Roujol S, Merle M, Quesson B, A method to improve transcostal MR guided High Intensity Focused Ultrasound thermal ablation in presence of electronic beam steering, Symposium of International Society for Therapeutic Ultrasound, Salt lake City, USA, 2013.	Symposium of International Society for Therapeutic Ultrasound	2013	Salt lake City	USA	International
1	MRGHIFU	Quesson B. Interventional MRI research in Bordeaux, réseau France Life Imaging (FLI), 2013, Strasbourg.	FLI	2013	Strasbourg	France	France
1	MRGHIFU	Elbes D, Jaïs P, Govari A, Beeckler C, Le Nost P, Merle M, Dumont E, Robert B, Quesson B. Feasibility of MR-guided catheter radiofrequency ablation in the sheep heart, Journées de la SFR TecSan 2013, Bordeaux.	SFR Tecsan	2013	Bordeaux	France	France
1	MRGHIFU	Elbes D, Jaïs P, Govari A, Beeckler C, Le Nost P, Merle M, Dumont E, Robert B, Quesson B. Feasibility of MR-guided catheter radiofrequency ablation in the sheep heart, RITS 2013, Bordeaux.	RITS	2013	Bordeaux	France	France
1	MRGHIFU	Emilien A, Benois-Pineau J, Elbes D, Quesson B, Adaptive rejection of outliers for robust motion compensation in cardiac MR-thermometry, RITS 2013, Bordeaux.	RITS	2013	Bordeaux	France	France
1	MRGHIFU	Elbes D, Roujol S, Merle M, Quesson B, A method to improve transcostal MR guided High Intensity Focused Ultrasound thermal ablation in presence of electronic beam steering, RITS 2013, Bordeaux.	RITS	2013	Bordeaux	France	France
1	MRGHIFU	Couillaud F. Imagerie moléculaire multimodale (2013) Conférencier invité, Montpellier, France	Imagerie moléculaire multimodale	2013	Montpellier	France	France
1	MRGHIFU	Durand P, Sandre O, Garaio E, Germain–Genevois C, Mornet S & Couillaud F Evaluation in vivo par bioimagerie de nanoparticules magnétiques pour les thermotérapies Cancéropole Grand Sud-Ouest, Limoges, France, 2013.	Canceropole GSO	2013	Limoges	France	France
1	MRGHIFU	Journée SFR TecSan (Université Bordeaux Segalen), Organisateur de la manifestation et animation pour l'axe « techniques interventionnelles et assistance aux patients), Bordeaux, 2013.	SFR Tecsan	2013	Bordeaux	France	France
1	MRGHIFU	Marquet F, Bour P, Amraoui S, Vaillant F, Dubois R, Quesson B. Non-invasive cardiac stimulation by MRI-guided focused ultrasound: a feasibility study on isolated beating pig heart. IEEE International Ultrasonics Symposium, Chicago, IL, USA, 2014.	IEEE International Ultrasonics Symposium	2014	Chicago	USA	International

WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
1	MRGHIFU	Elbes D, Magat J, Govari A, Ephrath Y, Vieillot D, Beeckler C, Jais P, Quesson B. In vivo evaluation of simultaneous MR-Electrophysiology in large animal model. ISMRM, Milan, Italy 2014.	ISMRM	2014	Milan	Italy	International
1	MRGHIFU	Vaillant F, Magat J, Naulin J, Loyer V, Vieillot D, Deschodt-Arsac V, Diolez P, Quesson B. Development of a MR-compatible ex vivo working pig heart setup for structural and functional analysis of cardiac diseases. ISMRM, Milan, Italy 2014.	ISMRM	2014	Milan	Italy	International
1	MRGHIFU	Elbes D, Magat J, Govari A, Ephrath Y, Vieillot D, Beeckler C, Jais P, Quesson B. Evaluation of simultaneous electrophysiology and MRI in large animal, HRS, San Francisco, 2014.	HRS	2014	San Francisco	USA	International
1	MRGHIFU	Quesson B. Ultrasons Focalisés guidés par IRM, Journées françaises de Radiologie, conférence invitée, Paris 2014.	JFR	2014	Paris	France	France
1	MRGHIFU	Vaillant F, Magat J, Naulin J, Loyer V, Vieillot D, Deschodt-Arsac V, Diolez P, Quesson B. MR-compatible working pig heart setup for structural and functional analysis of cardiac diseases. Printemps de la Cardiologie, Strasbourg, 2014.	Printemps de la Cardiologie	2014	Strasbourg	France	France
1	MRGHIFU	Bour P, Toupin S. Simultaneous measurement of temperature and displacement during HIFU ablation with realtime image transfert, Club IDEA 2014 (Siemens users meeting), Paris.	Siemens users meeting	2014	Paris	France	France
1	MRGHIFU	Ozenne V, Image reconstruction, real time framework & MR thermometry, Club IDEA 2014 (Siemens users meeting), Paris.	Siemens users meeting	2014	Paris	France	France
1	MRGHIFU	Bour P. Simultaneous MR-ARFI and MR-Thermometry during HIFU, TecSan meeting 2014, Bordeaux.	Tecsan Meeting	2014	Bordeaux	France	France
1	MRGHIFU	Vaillant F. Interaction between metabolism and function: benefits of ex vivo heart perfusion studies, l'Institut du Thorax, Nantes 2014.	l'Institut du Thorax	2014	Nantes	France	France
1	MRGHIFU	Couillaud F, Grenier N, Boutet J, Dinten J.M. Projet OPTICLINIC : Imagerie combinée Optique / Ultrason du cancer de la prostate. Bio-Imagerie Photonique et Santé en Aquitaine, Bordeaux, 2014	Bio-Imagerie Photonique et Santé en Aquitaine	2014	Bordeaux	France	France
2	ACTE	«Brain functional connectivity and morphology changes in medication-overuse headache: evidence for addiction-related processes.» Radat F., Di Scala G ., Dilharreguy B., Schoenen J., Allard M., Chanraud S. EFIC 8th International Pain in Europe Congress, Firenze, October 2013	EFIC 8th International Pain in Europe Congress	2013	Firenze	Italy	International
2	ACTE	«Brain functional connectivity and morphology changes in medication-overuse headache: evidence for addiction-related processes.» Di Scala G., Chanraud S., Dilaharreguy B., Schoenen J., Allard M., Radat F. 11e Colloque de la Société des Neurosciences, Lyon, Mai 2013	11e Colloque de la Société des Neurosciences	2013	Lyon	France	France
2	ACTE	«Motor control in aging: motor network connectivity at rest and behavioral abilities.» Decraene M., Di-Scala G., Guillaud E., Dilharreguy B., Doat E., Audiffren M., Cazalets J.R., Allard M., Chanraud S.» Colloque International sur le Vieillissement Cognitif. Caen, September 2014	Colloque International sur le Vieillissement Cognitif	2014	Caen	France	France
2	ACTE	«Age-related changes of controlled and automatic processes: a behavioural and imaging study.» Dupuy M., Di-Scala G, Dilharreguy B., Allard M., Chanraud S. Colloque International sur le Vieillissement Cognitif. Caen, September 2014	Colloque International sur le Vieillissement Cognitif. Caen	2014	Caen	France	France
2	HRDTI	V.-T. Ta, R. Giraud, D. L. Collins, P. Coupé. Optimized PatchMatch for Near Real Time and Accurate Label Fusion. MICCAI'14, pages 105-112, 2014.	MICCAI'14	2014	Boston	USA	International
2	HRDTI	M. Komlagan, V.-T. Ta, X. Pan, J.-P. Domenger, D. L. Collins, P. Coupé, ADNI. Anatomically Constrained Weak Classifier Fusion for Early Detection of Alzheimer's Disease, Machine Learning in Medical Imaging, pages 141-148, 2014	Machine Learning in Medical Imaging	2014	Boston	USA	International
4	IMMELAPT	Workshop « Aptamers 2014», Oxford, UK, March 24-25, 2014-11-02	Aptamers 2014	2014	Owford	UK	International
4	IMMELAPT	Symposium « Trends in Nanotechnology », Tokyo, Japan, Jan 29-31, 2014	Trends in Nanotechnology	2014	Tokyo	Japan	International

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4	IMMELAPT	« Emergence Forum », Barcelona, Spain, April 10-11, 2014	Emergence Forum	2014	Barcelona	Spain	International
4	IMMELAPT	Workshop « Integrated approaches for molecular detection », Catania, Italy, April, 28-30, 2014	Integrated approaches for molecular detection	2014	Catania	Italy	International
4	IMMELAPT	Symposium « Bordeaux-Kyoto », Bordeaux, France, May 5, 2014	Symposium « Bordeaux-Kyoto »	2014	Bordeaux	France	France
4	IMMELAPT	Journées Scientifiques du Médicament, Grenoble, France, June 19-20, 2014	Journées Scientifiques	2014	Grenoble	France	France
4	IMMELAPT	International Symposium for Nucleic Acid Chemistry, Kyushu, Japan, Nov 4-7, 2014	International Symposium for Nucleic Acid Chemistry	2014	Kyushu	Japan	International
4	IMMELAPT	Institute for Cell and Material Science, Kyoto University , Japan, Feb 4, 2014	Seminar	2014	Kyoto	Japan	International
4	IMMELAPT	Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Sendai, Oct 31, 2014	Seminar	2014	Sendai	Japan	International
4	IMMELAPT	Institute of Scientific and Industrial Research, Osaka University, Nov 2, 2014	Seminar	2014	Osaka	Japan	International
4	PIAF	American Association for Cancer Research, 6-10 avril 2013, Washingon DC, USA. S. Silvente-Poirot. Dendrogenin A is a newly identified mammalian steroidal alkaloid that induced cell death in melanoma cells through an LXRbeta-, Nur77- and Nor1-dependent way.	American Association for Cancer Research	2013	Washington	USA	International
4	PIAF	2nd Nuclear Technologies for health Symposium, 12-14 février 2014, Nantes, M. Szlosek-Pinaud. In the way of the "ideal" 18F-radiotracer targeting tumor neoangiogenesis : from the chemistry to the imaging of avb3 integrins in melanoma tumors.	2nd Nuclear Technologies for health Symposium	2014	Nantes	France	France
4	PIAF	American Head and Neck Society (AHNS) and International Federation of Head & Neck Oncologic Societies (IFHNOS), 26-30 juillet 2014 New York, USA. S. Silvente-Poirot. Dendrogenin A an innovative therapy against melanoma tumors.	American Head and Neck Society (AHNS)	2014	NY	USA	International
4	PRITOR	Champion C, Zanotti-Fregonara P, Quinto M. A. Morgat C, Hindié E. Comparative efficacy of 90Y, 177Lu and 111In for the irradiation of tumor cells and micrometastases: a Monte Carlo study using CELLDOSE. Annual Congress of the European Assocaition of Nuclear Medicine, 18-22 October 2014, Gothenburg, Sweden.	Annual Congress of the European Assocaition of Nuclear Medicine	2014	Gothenburg	Sweden	International
4	PRITOR	Morgat C, Mazère J, Fernandez P, Buj S, Vimont D, Schulz J, Lamare F. Methodological proposal to standardize dose-calibrators for new -+-emitters. Annual Congress of the European Association of Nuclear Medicine, 18-22 October 2014, Gothenburg, Sweden.	Annual Congress of the European Assocaition of Nuclear Medicine	2014	Gothenburg	Sweden	International
4	SUPSIFLU	Journée de l'ISM, Talence, 03/07/14, «Marquage au [12C]-, [13C]- et [11C]-CO de Substrats Bioconjugués pour la Synthèse Rapide de Traceurs Biologiques Spécifiques.», T. Cornilleau, H. Audrain, A. Guillemet, P. Hermange* and E. Fouquet*	ISM seminar	2014	Talence	France	France
4	SUPSIFLU	- GECO55, Samatan, 27/08/14, «General Last-Step Labelling of Biomolecule-Based Substrates by [12C], [13C] and [11C] Carbon Monoxide», P. Hermange	GECO55 CNRS	2014	Samatan	France	France
5	INNES	Gordon conference, Ventura, USA, mars 2013 : poster	Gordon conférence	2013	Ventura	USA	International
5	INNES	Euroglia, Berlin, juillet 2013 : organisation d'un symposium « ASTROCYTE NETWORK CONTRIBUTION IN NEUROIMAGING SIGNALS » et conférence « Functional neuro-energetic and brain imaging: how do astrocytes contribute to the signal? »	Euroglia	2013	Berlin	Germany	International
5	INNES	ESMRMB, Toulouse, octobre 2013 : communication orale : « Energetic metabolism during rat brain activation and role of the monocarboxylate transporter MCT2: a 13C-NMR spectroscopy study. »	ESMRMB	2013	Toulouse	France	France

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5	MIMATHUMAB	SFR TecSan during the scientific days (June 2013) "Targeted Iron Oxide Particles for In Vivo Magnetic Resonance Detection of Atherosclerotic Lesions With Recombinant Human Single chain Fv (scFv) antibody fragments" . G. Clofent-Sanchez	SFR TecSan	2013	Pessac	France	France
5	MIMATHUMAB	France Life Imaging (FLI) (July 8-9, 2013) "Days of chemistry for molecular imaging agents" SWP4 "Translational strategy of targeted nanoparticles for imaging of atherosclerosis". G. Clofent-Sanchez	FLI	2013	Montpellier	France	France
5	MIMATHUMAB	Thematic school «Functional Nanoparticles synthesis and biomedical applications» September 29 to October 4, 2013. Mélusine Larivière, Marie-Josée Jacobin-Valat, G. Clofent-Sanchez	CNRS thematic school	2013	Porque-rolles	France	France
5	MIMATHUMAB	Sysdiag (UMR 3145-BioRad; Montpellier) April 8, 2013. "Nano-objects for health: Interest of antibodies for molecular imaging of atherosclerotic plaques". G. Clofent-Sanchez	SYSDIAG	2013	Montpellier	France	France
5	MIMATHUMAB	GDR ACCITH « Anticorps et ciblage thérapeutique » coordinated by Pr Hervé Watier. Nov 2013. Molecular Imaging of the vulnerable atheroma plaque with human Ab fragments. Mélusine Larivière, Marie-Josée Jacobin-Valat, Jeanny Laroche-Traineau, G. Clofent-Sanchez	GDR ACCITH	2013	Montpellier	France	France
5	MIMATHUMAB	Boehringer Ingelheim Pharma GmbH & Co.KG/ Biberach Oct 2012." An in vivo phage display approach for the molecular targeting of atherosclerotic lesions ». G. Clofent-Sanchez	Boehringer (talk)	2013	Biberach	Germany	International
5	MIMATHUMAB	LFB Biotechnologies (Paris) (February 7 , 2014) "Theranostic of atherosclerosis using human antibody-targeted multi-modal nanoparticles for in situ delivery of drugs" . G. Clofent-Sanchez	LFB Biotechnologie	2014	Paris	France	France
5	MIMATHUMAB	4th International Conference on Superconductivity and Magnetism» (ICSM2014) Antalya, Turkey. April 27- May 2, 2014. Versatile and Multimodal Imaging Tool for Biological Applications; « Bioconjugation of multimodal nanoprobes for molecular imaging of vulnerables atherosclerosis plaques » ; L. Adumeau, E. Duguet, S. Mornet, G. Clofent-Sanchez	ICSM2014	2014	Antalya	Turkey	International
5	MIMATHUMAB	Seminar between Kyoto University and Bordeaux University. 5-6 May 2014. La Victoire, Bordeaux. Session : Medical Imaging and Its Application to Clinical Medicine. « Molecular Imaging of Atheroma with Human Antibody » G. Clofent-Sanchez	Kyoto University - Bordeaux University seminar	2014	Bordeaux	France	France
5	MIMATHUMAB	10ième congrès annuel de la Nouvelle Société Française d'Athérosclerose (NFSA) Biarritz 19-21 Juin 2014. Title : New developments on nanoparticles functionalized with human antibodies for molecular imaging of vulnerable atherosclerotic plaques. Mélusine Larivière, Marie-Josée Jacobin-Valat, Jeanny Laroche-Traineau, Laurent Adumeau, Majid Noubhani, Stéphane Sanchez, Claire Mazzocco, Franck Couillaud, Stéphane Mornet & Gisèle Clofent-Sanchez	NFSA 10th congress	2014	Biarritz	France	France
5	MIMATHUMAB	10th International Conference on the Scientific and Clinical Applications of Magnetic Carriers, Dresden, Germany (10-14 juin 2014); Versatile and Multimodal Imaging Tool for Biological Applications;Adumeau L., Laroche-Traineau J., Jacobin Valat M.-J., Nouhbani M., Clofent-Sanchez G., Duguet E., Mornet S.	10th International Conference on the Scientific and Clinical Applications of Magnetic Carrier	2014	Dresden	Germany	International
5	SCICOG&REACTIV, IBIONI	Hamel D, Deloire M, Saubusse A, Brochet B. Including ecological assessment in cognitive screening: a new approach to detect cognitive impairment in MS patients. REACTIV Study: ACTRIMS-ECTRIMS MSBoston 2014: Poster P145.	ACTRIMS-ECTRIMS	2014	Boston	USA	International
6	MOD	S. F. Eskildsen, P. Coupé, D. Garcia-Lorenzo, V. Fonov, J. C. Pruessner, D. L. Collins, ADNI. Improving prediction of Alzheimer's disease using patterns of cortical thinning and homogenizing images according to disease stage. MICCAI 2012 Workshop on Novel Imaging Biomarkers for Alzheimer's Disease and Related Disorders, pages 79-90, 2012.	MICCAI	2012	Nice	France	France

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6	MOD	P. Coupé, S. F. Eskildsen, J.V. Manjon, V. Fonov, J. C. Pruessner, M. Allard, D. L. Collins, ADNI. SNIPE: A New Method to Identify Imaging Biomarker for Early Detection of Alzheimer's Disease. MICCAI 2012 Workshop on Novel Imaging Biomarkers for Alzheimer's Disease and Related Disorders, pages 41-51, 2012.	MICCAI	2012	Nice	France	France
6	MOD	N. Guizard, V. S. Fonov, B. Aubert-Broche, P. Coupé, D. Garcia-Lorenzo, S. F. Eskildsen, D. L. Collins. Robust individual template pipeline for longitudinal MR images. MICCAI 2012 Atrophy measurement biomarkers using structural MRI for Alzheimer's disease: a challenge to assess measurement reliability and bias, 2012.	MICCAI	2012	Nice	France	France
6	MOD	V. Fonov, P. Coupé, S. F. Eskildsen, J.V. Manjon, D. L. Collins. Multi-atlas labeling with population-specific template and non-local patch-based label fusion. MICCAI 2012 Grand Challenge and Workshop on Multi-Atlas Labeling, pages 63-66, 2012 .	MICCAI	2012	Nice	France	France
6	MOD	P. Coupé, J. V. Manjon, V. Fonov, S. F. Eskildsen, D. L. Collins and ADNI. Patch-Based Morphometry: Application to Alzheimer's Disease. Alzheimer's Association International Conference, 2012.	AAIC	2012	Vancouver	Canada	International
6	MOD	S. F. Eskildsen, V. Fonov, P. Coupé, D. L. Collins and ADNI. Visualizing Stages of Cortical Atrophy in Progressive MCI From the ADNI Cohort. Alzheimer's Association International Conference, 2012.	AAIC	2012	Vancouver	Canada	International
6	MOD	V. S. Fonov, P. Coupé, M. Styner, D. L. Collins. Automatic lateral ventricle segmentation in infant population with high risk of autism. Organization for Human Brain Mapping, 2012.	Organization for Human Brain Mapping	2012	Beijing	China	International
6	MOD	S. F. Eskildsen, J. V. Manjon, P. Coupé, V. Fonov, D. L. Collins. Superresolution improves MRI cortical segmentation with FACE. Organization for Human Brain Mapping, 2012.	Organization for Human Brain Mapping	2012	Beijing	China	International
6	MOD	J. V. Manjón, P. Coupé, L. Concha, A. Buades, D. L. Collins, M. Robles. DWI denoising using overcomplete Local PCA Decomposition. ISMRM 2012, Melbourne, 2012.	ISMRM	2012	Melbourne	Australia	International
6	MOD	Ries M, Denis de Senneville B, Regard Y, Moonen C T W, Combined Ultrasound Echography and Magnetic Resonance Imaging Guidance for motion compensated HIFU Interventions, AIP Conf Proc, 2012.	AIP Conf Pro	2012	Sydney	Australia	International
6	MOD	Denis de Senneville B, Ries M, Moonen C T W, Robust real-time MR-geometric distortion correction for interventional procedure on mobile targets, 9th IEEE Int Symp on Biomedical Imaging (ISBI), 2012. Barcelona.	ISBI	2012	Barcelona	Spain	International
6	MOD	Deckers R, Merckel L. G, Baron P, Denis de Senneville B, Bleys R, van den Bosch M. A. A. J, Bartels L. W, HIFU ablation of human breast tissue leads to local tissue deformation, 12th International symposium on Therapeutic Ultrasound (ISTU), 2012.	ISTU	2012	Heidelberg	Germany	International
6	MOD	Ries M, Denis de Senneville B, Regard Y, Moonen C T W, Combined Ultrasound Echography and Magnetic Resonance Imaging Guidance for motion compensated HIFU Interventions, 12th International symposium on Therapeutic Ultrasound (ISTU), 2012.	ISTU	2012	Heidelberg	Germany	International
6	MOD	Lorenzato C, Cernicanu A, Smirnov P, Denis de Senneville B, Germain M, Meyre M. E, Ries M, Moonen C T W, Dynamic PRF/$Delta$T1/T2* monitoring for the characterization of HIFU heat-induced USPIO release from thermosensitive liposomes, 12th European Symposium on Controlled Drug Delivery (ECDD), 2012, Bergen.	ECDD	2012	Bergen	Norway	International
6	MOD	Lorenzato C, Cernicanu A, Meyre M. E, Germain M, Denis de Senneville B, Bos C, Moonen C T W, Smirnov P, MRI drug delivery evaluation with ultrasound triggered magnetoliposomes, 12th European Symposium on Controlled Drug Delivery (ECDD), 2012, Bergen.	ECDD	2012	Bergen	Norway	International

WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
6	MOD	Derieppe M, Yudina A, Lepetit-Coiffe M, Denis de Senneville B, Bos C, Moonen C.T.W, Real-time assessment of ultrasound-mediated drug delivery using fibered confocal fluorescence microscopy, 12th European Symposium on Controlled Drug Delivery (ECDD), 2012, Bergen.	ECDD	2012	Bergen	Norway	International
6	MOD	Lorenzato C, Cernicanu A, Smirnov P, Denis de Senneville B, Germain M, Meyre M. E, Ries M, Moonen C T W, Rapid dynamic PRF/DeltaT1/T2* monitoring for the characterization of heat-induced USPIO release from thermosensitive liposomes, International Society of Magnetic Resonance in Medicine, 2012, Melbourne.	ISMRM	2012	Melbourne	Australia	International
6	MOD	Ries M, Denis de Senneville B, Regard Y, Moonen C T W, Combined Magnetic Resonance Imaging and Ultrasound Echography Guidance for motion compensated HIFU Interventions, International Society of Magnetic Resonance in Medicine, 2012, Melbourne.	ISMRM	2012	Melbourne	Australia	International
6	MOD	Denis de Senneville B, Hey S, Moonen C T W, Ries M, Super-resolution for real-time volumetric MR temperature imaging, International Society of Magnetic Resonance in Medicine, 2012, Melbourne.	ISMRM	2012	Melbourne	Australia	International
6	MOD	Denis de Senneville B, Roujol S, Hey S, Moonen C T W, Ries M, Kalman Filtering for undersampeled continuous volumetric MR-Temperature Imaging, International Society of Magnetic Resonance in Medicine, 2012, Melbourne.	ISMRM	2012	Melbourne	Australia	International
6	MOD	E. Garyfallidis, M. Paquette, S. St-Jean, P. Coupé, M. Descoteaux. Deconvolution enhanced Generalized Q-Sampling 2 and DSI deconvolution. ISBI'13, HARDI Reconstruction Challenge, page 18, 2013.	ISBI	2013	San Francisco	USA	International
6	MOD	N. Guizard, K. Nakamura, P. Coupé, D. L. Arnold, D. L. Collins. Non-local MS MRI lesion inpainting method for image processing. endMS conference, Saint-Sauveur, Canada, 2013	endMS conference	2013	Saint-Sauveur	Canada	International
6	MOD	M. Paquette, E. Garyfallidis, S. St-Jean, P. Coupé, M. Descoteaux. Particle Swarm Optimization in Multi-Tensor Imaging. ISBI'13, HARDI Reconstruction Challenge, page 16, 2013.	ISBI	2013	San Francisco	USA	International
6	MOD	E. Garyfallidis, S. St-Jean, M. Paquette, P. Coupé, M. Descoteaux. Constrained spherical deconvolution on signal and ODF values. ISBI'13, HARDI Reconstruction Challenge, page 17, 2013.	ISBI	2013	San Francisco	USA	International
6	MOD	Denis de Senneville B, Ries M, Moonen C T W, Real-time anticipation of organ displacement for MR-guidance of interventional procedures, 10th IEEE Int Symp on Biomedical Imaging (ISBI), 2013. San Francisco.	ISBI	2013	San Francisco	USA	International
6	MOD	Derieppe M, Rojek K, Denis de Senneville B, Bos C, Moonen C T W, Recruitment of Endocytosis in Ultrasound-mediated Drug Delivery: a Real-time Study, The Sixth Annual World Molecular Imaging Congress, 2013, Savannah, Georgia.	Sixth Annual World Molecular Imaging Congress	2013	Savannah	USA	International
6	MOD	Denis de Senneville B, Ries M, Moonen C T W, Extended Kalman Filtering for Continuous volumetric MR-Temperature Imaging, International Society of Magnetic Resonance in Medicine, 2013, Salt Lake City.	International Society of Magnetic Resonance in Medicine	2013	Salt Lake City	USA	International
6	MOD	Denis de Senneville B, Ries M, Moonen C T W, MR-guided thermotherapy of abdominal organs using a robust PCA-based motion descriptor. International Society of Magnetic Resonance in Medicine, 2013, Salt Lake City.	International Society of Magnetic Resonance in Medicine	2013	Salt Lake City	USA	International
6	MOD	Deckers R, Denis de Senneville B, Ries M, Heerkens H. D, Van de Berg N, Van Vulpen M, Moonen C T W, Feasibility of MR thermometry in pancreas. International Society of Magnetic Resonance in Medicine, 2013, Salt Lake City.	International Society of Magnetic Resonance in Medicine	2013	Salt Lake City	USA	International
6	MOD	Stemkens B, Tijssen R. H, Van den Berg C. A. T, Lagendijk J. J. W, Moonen C T W, Ries M, Denis de Senneville B, MR-guided thermotherapy of abdominal organs using a robust PCA-based motion descriptor. International Society of Magnetic Resonance in Medicine, 2013, Salt Lake City.	International Society of Magnetic Resonance in Medicine	2013	Salt Lake City	USA	International

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6	MOD	Stemkens B, Tijssen R. H, Denis de Senneville B, Lagendijk J. J. W, Van den Berg C. A. T, Assessment of fast external and internal motion surrogates to supplement MRI based tracking of the pancreas. European Society for Therapeutic Radiology and Oncology, 2013, Switzerland.	European Society for Therapeutic Radiology and Oncology	2013	Geneva	Switzer-land	International
6	MOD	Denis de Senneville B, Ries M, Moonen C T W, Real-time image-guidance of non-invasive interventional procedures, 10th IEEE International Symposium on Biomedical Imaging (ISBI), 2013, San Francisco.	ISBI	2013	San Francisco	USA	International
6	MOD	B. Aubert-Broche, V. Fonov, D. Garcia-Lorenzo, A Mouiha, N. Guizard, P. Coupe, S. F. Eskildsen, D. L. Collins. A new framework for analyzing structural volume changes of longitudinal brain MRI data. Spatio-temporal Image Analysis for Longitudinal and Time-Series Image Data, LNCS, Volume 7570, pp 50-62, 2012.	5th International Conference, ICLA 2013	2013	Chennai	India	International
6	MOD	M. Komlagan, V.-T. Ta, X. Pan, J.-P. Domenger, D. L. Collins, P. Coupé, ADNI. Anatomically Constrained Weak Classifier Fusion for Early Detection of Alzheimer's Disease, Machine Learning in Medical Imaging, pages 141-148, 2014.	MLMI	2014	Boston	USA	International
6	MOD	S. F. Eskildsen, P. Coupé, V. Fonov, D. L. Collins, ADNI. Detecting Alzheimer's disease by morphological MRI using hippocampal grading and cortical thickness. CADDementia challenge on computer-aided diagnosis of dementia based on structural MRI, MICCAI'14, accepted, 2014.	MICCAI	2014	Boston	USA	International
6	MOD	V.-T. Ta, R. Giraud, D. L. Collins, P. Coupé. Optimized PatchMatch for Near Real Time and Accurate Label Fusion. MICCAI'14, pages 105-112, 2014.	MICCAI	2014	Boston	USA	International
6	MOD	P. Coupé, O Periot, J. V. Manjón, B. Hiba, M. Allard. Impact of DWI denoising on Tack-Density Imaging. Organization for Human Brain Mapping'14, 2014.	Organization for Human Brain Mapping	2014	Hambourg	Germany	International
6	MOD	J. V. Manjón, P. Coupé, A. Buades. Non-local PCA-based MRI denoising. Organization for Human Brain Mapping'14, 2014.	Organization for Human Brain Mapping	2014	Hambourg	Germany	International
6	MOD	S. St-Jean, P. Coupé, M. Descoteaux. Non Local Spatial and Angular Matching : a new denoising technique for diffusion MRI. International Symposium on Magnetic Resonance in Medicine (ISMRM'14), 2014.	ISMRM	2014	Milan	Italy	International
6	MOD	Denis de Senneville B, Regard Y, Moonen C T W, Ries M, Combined Magnetic Resonance and Ultrasound Echography Guidance for direct and indirect motion tracking, 11th IEEE Int Symp on Biomedical Imaging (ISBI), 2014. Beijing.	ISBI	2014	Beijing	China	International
6	MOD	Zachiu C, Denis de Senneville B, Crijns S, Raaymakers B, Moonen C T W, Ries M, A Framework for Slow Physiological Motion Compensation During HIFU Interventions in the Liver: Proof of Concept, International Symposium on Focused Ultrasound, 2014, Bethesda, Maryland.	International Symposium on Focused Ultrasound	2014	Bethesda	USA	International
6	MOD	Deckers R, Denis de Senneville B, Merckel L, Schubert G, Köhler M, Mali W, Moonen C T W, van den Bosh M.A.A, Knuttel F. M, Bartels L. W, Performance analysis of a dedicated breast MR-HIFU system during ablation of breast tumors in patients, International Symposium on Focused Ultrasound, 2014, Bethesda, Maryland.	International Symposium on Focused Ultrasound	2014	Bethesda	USA	International
6	MOD	Stemkens B, Tijssen R, Denis de Senneville B, Lagendijk J, van den Berg C, Retrospective Reconstruction of 3D Radial MRI Data to Evaluate the Effect of Abdominal Compression On 4D Abdominal Organ Motion, American Association for Physicists in Medicine, 2014, Austin, Texas.	American Association for Physicists in Medicine	2014	Austin	USA	International
6	MOD	Stemkens B, Tijssen R.H.N, Heerkens H.D, Denis de Senneville B, Meijer G.J, Van Vulpen M, Lagendijk J.J.W, Van den Berg C.A.T, 4D motion analysis using retrospective binning of MR images in the abdomen, European Society for Therapeutic Radiology and Oncology, 2014, Vienna.	European Society for Therapeutic Radiology and Oncology	2014	Vienna	Austria	International

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6	MOD	Derieppe M, Rojek K, Denis de Senneville B, Bos C, Moonen C T W, Recruitment of Endocytosis in Ultrasound-mediated Drug Delivery: a Real-time Study, 6th International Conference of Cellvizio users (ICCU), 2014, Opio-en-Provence, France.	6th International Conference of Cellvizio users	2014	Opio-en-Provence	France	France
6	MOD	Derieppe M, Denis de Senneville B, Kuijf H, Moonen C T W, Bos C, Tracking of Cell Nuclei for Assessment of In Vitro Uptake Kinetics in Ultrasound-Mediated Drug Delivery Using Fibered Confocal Fluorescence Microscopy, 6th International Conference of Cellvizio users (ICCU), 2014, Opio-en-Provence, France.	6th International Conference of Cellvizio users	2014	Opio-en-Provence	France	France
6	MOD	Deckers R, Denis de Senneville B, Schubert G, Merckel L.G, Vaessen H.H.B, van den Bosch M.A.A.J, Moonen C.T.W, Bartels L.W, Evaluation of respiration-induced magnetic field disturbance correction of MR thermometry in volunteers and in patients for MR-HIFU ablation of breast cancer: the effects of conscious sedation, International Society of Magnetic Resonance in Medicine, 2014, Milan.	International Society of Magnetic Resonance in Medicine	2014	Milan	Italy	International
6	MOD	Lorenzato C, Oerlemans C, Denis de Senneville B, Moonen C, Bos C, Rapid Dynamic Temperature/ T1/T2* Assessment: A Method With Potential For Monitoring Drug Delivery, International Society of Magnetic Resonance in Medicine, 2014, Milan.	International Society of Magnetic Resonance in Medicine	2014	Milan	Italy	International
6	MOD	Stemkens B, Tijssen R, Denis de Senneville B, Lagendijk J, van den Berg C, Optimal MRI sampling and binning for online 4D retrospective respiratory motion analysis of the abdomen, International Society of Magnetic Resonance in Medicine, 2014, Milan.	International Society of Magnetic Resonance in Medicine	2014	Milan	Italy	International
6	MOD	Derieppe M, Denis de Senneville B, Kuijf H, Bos C, Moonen C T W, Cell Tracking for Assessment of In-Vitro Uptake Kinetics in Ultrasound-Mediated Drug Delivery using Fibered Confocal Fluorescence Microscopy, 11th IEEE Int Symp on Biomedical Imaging (ISBI), 2014. Beijing.	ISBI	2014	Beijing	China	International
6	MOD	Derieppe M, Rojek K, Denis de Senneville B, Bos C, Moonen C T W, Recruitment of Endocytosis in Ultrasound-mediated Drug Delivery: a Real-Time Study, The 19th European symposium on Ultrasound Contrast Imaging, 2014. Rotterdam.	19th European symposium on Ultrasound Contrast Imaging		Rotterdam	Nether-lands	International
7	ABACI	Crivello F, Maillard P, Grassiot B, Dufouil C, Delcroix N, Tzourio-Mazoyer N, Tzourio C, Mazoyer B (2012) Grey matter loss in the elderly: A longitudinal study of a cohort of 1,172 healthy individuals over 65 years. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Herve P-Y, Jobard G, Mellet E, Zago L, Razafimandimby A, Vigneau M, Petit L, Crivello F, Joliot M, Mazoyer B, Tzourio-Mazoyer N (2012b) Hearing about others: an fMRI study of theory-of-mind sentence comprehension. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Joliot M, Naveau M, Herve P-Y, Petit L, Zago L, Crivello F, Jobard G, Mellet E, Tzourio-Mazoyer N, Mazoyer B (2012) Establishing homotopic inter-hemispheric regional correspondences via rest functional connectivity. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Marie D, Herve P-Y, Petit L, Crivello F, Jobard G, Joliot M, Zago L, Mellet E, Mazoyer B, Tzourio-Mazoyer N (2012) Morphology and surface area of Heschl's gyri in 216 right and 198 left-handers. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Mellet E, Tzourio-Mazoyer N, Petit L, Zago L, Herve P-Y, Jobard G, Joliot M, Crivello F, Mazoyer B (2012a) Eyedness andhandedness interact on functional lateralization during hand identification. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International

WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
7	ABACI	Mellet E, Crivello F, Petit L, Zago L, Herve P-Y, Jobard G, Joliot M, Mazoyer B, Tzourio-Mazoyer N (2012b) What are the factors driving the variability of verbal and spatial skills? A study in 434 subjects. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Naveau M, Delcroix N, Herve P-Y, Petit L, Zago L, Crivello F, Jobard G, Mellet E, Tzourio-Mazoyer N, Mazoyer B, Joliot M (2012a) MICCA: Multi-scale independant component clustering algorithm. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Naveau M, Gautier L, Delcroix N, Herve P-Y, Petit L, Zago L, Crivello F, Jobard G, Mellet E, Tzourio-Mazoyer N, Mazoyer B, Joliot M (2012b) Searching for Hubs of Degree and Betweenness in the Connectivity Graph of the Resting-State Networks. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Petit L, Crivello F, Mellet E, Jobard G, Zago L, Joliot M, Perchey G, Mazoyer B, Tzourio-Mazoyer N (2012a) BIL&GIN: a database for the study of hemispheric specialization. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Petit L, Mellet E, Zago L, Crivello F, Herve P-Y, Jobard G, Joliot M, Mazoyer B, Tzourio-Mazoyer N (2012b) Hemispheric functional asymmetry in saccades and eyedness contribute to the 'leftie advantage'. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Tzourio-Mazoyer N, Petit L, Mellet E, Jobard G, Zago L, Herve P-Y, Crivello F, Joliot M, Mazoyer B (2012) Left-handersp resent a right shift of their motor, verbal and spatial functional lateralization. 18th Conference of the Organization for Human Brain Mapping. Pekin, June 9-15, 2012.	18th Conference of the Organization for Human Brain Mapping	2012	pekin	China	International
7	ABACI	Mazoyer B (2012) PET in neurological research and diagnostics. PETRAD 2012, Varsaw, 16-19 May 2012. Nuclear Medicine Review 15, sup A: A11.	PETRAD	2012	Varsaw	Poland	International
7	ABACI	Duriez G, Crivello F, Tzourio-Mazoyer N, Mazoyer B (2013) Chronic smoking and brain atrophy: cross-sectional and longitudinal assessment in a cohort of 1,184 healthy elderly. 19th Conference of the Organization for Human Brain Mapping. Seattle, June 15-21, 2013.	19th Conference of the Organization for Human Brain Mapping	2013	Seattle	USA	International
7	ABACI	Marie D, Jobard G, Leroux G, Crivello F, Joliot M, Petit L, Mellet E, Zago L, Mazoyer B, Tzourio-Mazoyer N (2013) Heschl's gyri anatomy and handedness interact on the lateralization of speech listening. 19th Conference of the Organization for Human Brain Mapping. Seattle, June 15-21, 2013.	19th Conference of the Organization for Human Brain Mapping	2013	Seattle	USA	International
7	ABACI	Tzourio-Mazoyer N, Marie D, Zago L, Jobard G, Mellet E, Petit L, Crivello F, Joliot M, Mazoyer B (2013) Language lateralization in 297 healthy volunteers: Association with manual preference strength exists only in left-handers. In: Neuroscience 2013. San Diego, CA, USA.	Neurosciences	2013	San diego	USA	International
7	ABACI	Budisavljevic S, Tzourio-Mazoyer N, Leroux G, Petit L, Joliot M, Jobard G, Perchey G, Crivello F, Zago L, Mazoyer B, Mellet E (2014) Functional architecture of the brain during mental rotation of hands: a study of 145 right-handers. In: 20th Conference of the Organization for Human Brain Mapping: Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Hau J, Sarubbo S, Perchey G, Crivello F, Joliot M, Zago L, Jobard G, Mellet E, Mazoyer B, Tzourio-Mazoyer N, Petit L (2014) Stem-based tractography to study the anatomical connectivity of human brain white matter pathways. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International

WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
7	ABACI	Hau J, Perchey G, Sarubbo S, Joliot M, Crivello F, Jobard G, Zago L, Mellet E, Mazoyer B, Tzourio-Mazoyer N, Petit L (2014) Anatomical connectivity of the inferior fronto-occipital fasciculus using stem-based tractography. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Marie D, Maingault S, Crivello F, Jobard G, Zago L, Petit L, Mellet E, Joliot M, Mazoyer B, Tzourio-Mazoyer N (2014) Cortical thickness and surface area variations with Heschl gyri duplication in 430 healthy subjects. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Marie D, Zago L, Jobard G, Perchey G, Leroux G, Mellet E, Joliot M, Petit L, Mazoyer B, Tzourio-Mazoyer N (2014) Heschl's gyrification pattern, lateralization during speech listening, and handedness. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Mazoyer B, Zago L, Jobard G, Crivello F, Joliot M, Perchey G, Mellet E, Petit L, Tzourio-Mazoyer N (2014) Gaussian mixture modeling of lateralization for language in a large sample balanced for handedness. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Mellet E, Mazoyer B, Petit L, Joliot M, Jobard G, Perchey G, Crivello F, Zago L, Tzourio-Mazoyer N (2014) A weak language lateralization affects both verbal and spatial skills: an fMRI study in 297 subjects. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Tzourio-Mazoyer N, Joliot M, Petit L, Jobard G, Perchey G, Leroux G, Crivello F, Mellet E, Zago L, Mazoyer B (2014) Handedness and ipsilateral motor activity during finger movements: fMRI study of 142 right- & 149 left-handers. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Zago L, Hervé PY, Genuer R, Jobard G, Crivello F, Petit L, Mellet E, Mazoyer B, Tzourio-Mazoyer N, Joliot M (2014) Hemispheric pattern of dominance: machine learning of sentence production in 297 healthy volunteers. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Zago L, Petit L, Crivello F, Mellet E, Jobard G, Joliot M, Mazoyer B, Tzourio-Mazoyer N (2014) Causal complementary hemispheric specialization exists only in strong left-handers. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping	2014	Hamburg	Germany	International
7	ABACI	Mazoyer B, Crivello F, Joliot M, Petit L, Mellet E, Jobard G, Zago L, Tzourio-Mazoyer N (2014) Préférence manuelle et latéralisation pour le langage : étude en IRMF d'un échantillon de 297 sujets dont 153 gauchers. Société Française de Neuroradiologie, Paris, 3 -5 juin 2014.	SFN	2014	Paris	France	France
7	TRAIL&TRACKS	Hau J, Sarubbo S, Petit L (2013) Stem-based tractography of long association fibers of the human brain. In: ISMRM Scientific Workshop - Diffusion as a Probe of Neural Tissue Microstructure. Podstrana (Croatia).	ISMRM Scientific Workshop	2013	Podstrana	Croatia	International
7	TRAIL&TRACKS	Hau J, Sarubbo S, Perchey G, Crivello F, Joliot M, Zago L, Jobard G, Mellet E, Mazoyer B, Tzourio-Mazoyer N, Petit L (2014) Stem-based tractography to study the anatomical connectivity of human brain white matter pathways. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping.	2014	Hamburg	Germany	International
7	TRAIL&TRACKS	Hau J, Perchey G, Sarubbo S, Joliot M, Crivello F, Jobard G, Zago L, Mellet E, Mazoyer B, Tzourio-Mazoyer N, Petit L (2014) Anatomical connectivity of the inferior fronto-occipital fasciculus using stem-based tractography. In: 20th Conference of the Organization for Human Brain Mapping. Hamburg, Germany.	20th Conference of the Organization for Human Brain Mapping.	2014	Hamburg	Germany	International

WP	Research theme	Scientific Publication	Event	Year	City	Country	France/ international
2	NEWFISP	(b)SSFP sequences with navigator based retrospective motion correction for in vivo iron-labeled cancer cell and metastases detection in the mouse liver at 7T, E.J. Ribot, T. Duriez, A. Trotier, J-M. Franconi, S. Miraux	ESMRMB 2013	2013	Toulouse	France	France
2	NEWFISP	Accelerated time-resolved Time-Of-Flight Magnetic Resonance Angiography in Mice Models, W Lefrançois, C Castets, A Trotier, E Thiaudière, JM Franconi, and S Miraux	ISMRM 2014	2014	Milan	Italy	International
2	NEWFISP	Vastly undersampled time-resolved TOF MR angiography in mice with a prospective 3D radial double golden angle approach. AJ Trotier, W Lefrançois, EJ Ribot, E Thiaudière, JM Franconi, and S Miraux	ISMRM 2014	2014	Milan	Italy	International
2	NEWFISP	Water or Fat selective 3D-bSSFP imaging combined with banding artifact correction for MSK imaging at 3T. EJ Ribot, JM Franconi, and S Miraux	ISMRM 2014	2014	Milan	Italy	International
2	NEWFISP	Water or Fat selective 3D-bSSFP imaging combined with banding artifact correction on small-animal at 7T. EJ Ribot, D Wecker, JM Franconi, and S Miraux	ISMRM 2014	2014	Milan	Italy	International
2	NEWFISP	Angiographie et Angiographie résolue dans le temps par RMN chez le petit animal.	GDR Metice	2013	Paris	France	France
2	NEWFISP	Angiographie et angiographie résolue dans le temps par IRM chez le petit animal	Printemps de la cardiologie	2014	Strasbourg	France	France

Annex C

Scientific results per work package

WP1: MRI guided HIFU

Research objective of WP1

WP 1 aims to develop preclinical and clinical research activities in the field of image guided therapeutic procedures. The main focus was given to the combination of High Intensity Focused Ultrasound (non-invasive treatment) and MRI (targeting, real-time monitoring of the procedure and follow-up). Following a translational approach, such methods should be developed for studies on small and large animals, and be applicable to the treatment of clinical diseases in oncology and cardiology. Due to the important modifications of the local research teams at the beginning of the TRAIL funding (the core laboratory headed by Dr C Moonen was closed mid 2011), a strong effort has been made over the last 3 years to progressively reorganize this activity.

Project building

Dr B Quesson, CNRS researcher at Inserm U1045 and head of the imaging team of the IHU LIRYC Institute was in charge of this task. Image Guided Therapy SA (local company developing MR-compatible HIFU technology) was identified as the industrial partner for HIFU devices. This project required important investment in dedicated equipment and received the financial support from:

- IHU LIRYC grant for the acquisition acquiring a 256 elements MR-compatible HIFU device designed for large animal studies
- France Life Imaging grant for 1) the design and acquisition (co-financial support of the Aquitaine council) of a benchtop HIFU setup for rodents (under effective operation since january 2014), 2) a Clinical MR-HIFU platform for the treatment of breast tumours (system delivered end November 2014, 3) a preclinical MR-compatible HIFU device dedicated to rodent (to be operated in high field MRI Bruker scanner) to be acquired first quarter 2015.

Current scientific activities and results

Cardiology

This task is part of the IHU LIRYC research project. The objective is to develop non-invasive treatment of cardiac arrhythmia using thermal ablation and contactless stimulation. The research team showed the proof of concept of both thermal ablation and contactless cardiac stimulation on an ex vivo model of beating pig heart (Vaillant et al, ISMRM 2014). Stimulation was performed using non-destructive HIFU burst pulses (millisecond range) that are delivered synchronously with the cardiac cycle to induce premature atrial/ventricular contraction (Marquet et al, ultrasound IEEE symposium 2014).

Schematic (a) of the setup. The ex vivo heart is continuously beating and positioned on top of a 256 elements HIFU platform. Two MR-compatible catheters are inserted into the left atrium and ventricle to collect contact electrophysiology (EP) signals in both cavities. MR image allowing precise 3D selection of the HIFU spot location in the ventricle. EP signals (c) recording over 3 heart beats showing successive depolarisations of the atrium (top trace) followed by the ventricle (middle trace). The first 2 beats are in sinus rhythm and a premature ventricular contraction can be observed when an HIFU pulse of 5 msec is generated (bottom trace) after the refractory period of the ventricle. Photograph of heart showing a thermal lesion induced in the ventricle with a 10 sec HIFU sonication at 120 W acoustic power. The lesion is approximately 3x10 mm in dimensions and is located into the myocardium. Such a lesion is difficult to achieve with conventional catheter-based ablation, where the active part of the catheter is in contact with either the endocardium or epicardium.

For this research project, dedicated MR instrumentation

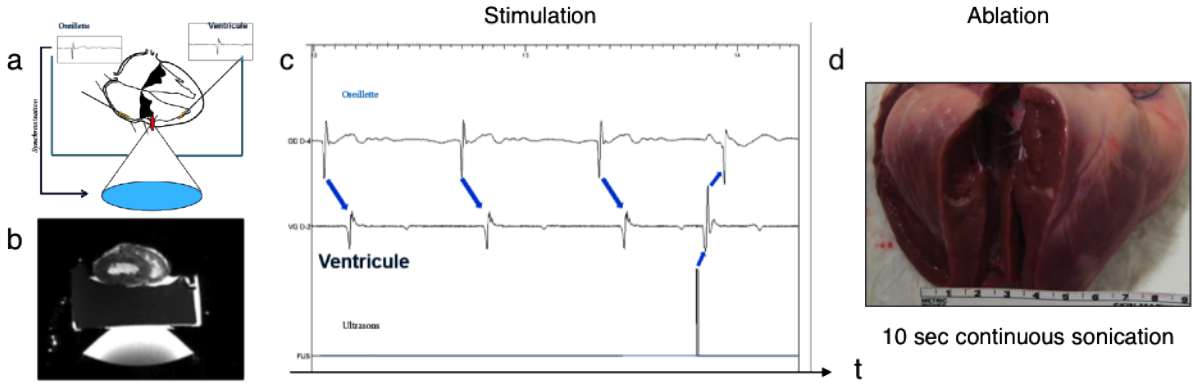


Figure 1: contactless cardiac stimulation (a-c) and ablation (d) with MR-guided HIFU on a pig heart.

(electrophysiology catheters, filters…), HIFU methods (burst pulses synchronized on the electrophysiological signals, trans-costal HIFU sonication, enhanced sonication efficacy by non-linear ultrasound effects such as cavitation and boiling), Real-time MRI (sub-second acquisition and reconstruction methods, real-time data transfer, real-time motion correction and processing) for monitoring temperature (MR-thermometry) and displacement (MR-ARFI) induced by ultrasound are currently developed (abstracts submitted to ISMRM 2015 conference). This application is probably one of the most challenging due to motion of the organ (cardiac contraction and respiration), presence of ribs in the HIFU beam path and important cooling effect due to blood flow into the cardiac cavities. The research team (2 post-docs, 2 docs, 2 engineers, 1 technician, all part of the IHU imaging team) is working on addressing these major technical challenges and each improvement will directly benefit to other applications (e.g. breast, liver…) in order to offer a better control of the procedure for patient safety and increased treatment efficacy. The IHU is equipped with a 1.5 T Siemens Avanto and a Bruker 9.4T/30 cm, both full time dedicated to preclinical research and technical developments. Real-time cardiac thermometry/MR-ARFI is currently being developed in this team. The imaging methods and associated processing are directly transferable to other organs.

Small animal studies

The HIFU benchtop is currently used in projects (Dr Franck Couillaud) on transgenic mice bearing tumours expressing thermo-inducible optical imaging reporter proteins for bioluminescence and fluorescence. This work tries to establish in vivo proof of concept for innovative thermo-therapies targeting tumours microenvironment (macrophages and angiogenesis).

Several teams working at University of Bordeaux have shown interest in having access to the MR-HIFU technology adapted to small animal for different applications (brain, heart, liver, study of pain processes, tissue regeneration…) and strategies (ablation, control of gene activation, stimulation, drug delivery). Most of these teams will benefit from the new MR-HIFU platform dedicated to small animal (installation planned first half 2015). The financial support of TRAIL in human resources will help setting up this open platform over the next two years. One of the objectives is to develop and easy-to-use MR-HIFU platform in order to help the development of collaborative projects between the local teams and to attract other research teams for future applications. For this purpose, it appeared necessary to integrate this HIFU platform into a high field magnet in order to provide higher spatial resolution of the MR images. Dedicated acquisition sequences will be developed and associated image processing. Collaboration has been initiated with Dr Benoît Larrat (CEA Saclay) who has an established expertise in this domains, and share similar research interest and technological platform.

Transfer toward Clinical applications

One MR-HIFU platform (Philips Sonalleve) is already installed at Hospital Saint-André (Pr H Trillaud,) for the treatment of Uterine Fibroids. A second platform dedicated to the non-invasive treatment of breast cancer has recently been acquired. This project associates IGT SA (Erik Dumont), IHU LIRYC (Bruno Quesson), Anti Cancer Center Bergonié (Pr Jean Palussière) and University of Utah (Pr Dennis Parker). After initial testing of the platform at IHU LIRYC, the breast system will be transferred to the anticancer centre with the objective of treating the first patients in first half of 2015.

Added value of TRAIL funding

The main financial contribution of TRAIL for the development of these research projects is a 2 years post-doctoral position for the development of the small animal platform and the treatment of the breast tumours. Regarding the large number of research topics mentioned above, the financial support from TRAIL for human resource is expected to be increased in the future to accelerate project development.

WP2: new sequences, new contrasts

The goal of the WP2, is to develop innovative MR sequences and to applied these new methods in clinical domain, from oncology to neurosciences.

The effort has been focused on the development on 3D (and more) sequences to become more quantitative, to increase spatial and temporal resolutions, increase sensitivity and specificity of MRI.

Project are generally divided on three main and interconnected steps: sequences design and implantation, preclinical evaluation (on small animals) and transfer to clinical research and applications.

Since TRAIL starting in 2011, two project have been funded in the WP2 :

- HR-DTI (2013-2016), PI : B Hiba, 130 k€. The goal of this project is to develop robust Diffusion MR sequences and reconstruction algorithm and applied them for high resolution diffusion tensor imaging of the brain.
- NewFISP (2013-2018), PI : S. Miraux, 250 k€. The goal of this project is to develop new 3D sequences based on gradient echo acquisition and applied them for cardiovascular imaging and oncology imaging.

Originality

To generate 3D time-resolved images (for cardiac imaging) or images with high spatial resolutions (for diffusion imaging) it is necessary to acquire MR information as quickly as possible. This limits motion artifacts and too long examination time.

To do this, in the NewFISP project, method of non-Cartesian k-space encoding scheme was developed. This method, with a double golden angle strategies (double random), allows to generate 3D cine angiography, in small animals, with a acceleration factor of 5 compared to the conventional cartesian method (Trotier al. MRM 2014).

In the HR-DTI project, robust reconstruction algorithms were implemented to rebuild diffusion images with very high spatial resolution based classical 3D diffusion imaging sequences with short acquisition time (Coupé et al. NeuroImage 2013).

Orientations

The next steps of the WP2 will focus on the development of non-cartesian, or hybrid radial-cartesian 3D k-space encoding scheme and coupled these new methods with powerful reconstruction strategies like Parallel Imaging or Compressed sensing.

The transfer of already published methods from preclinical to clinical research will also be a major part of the WP2.

Strength

Based on new radial sequences developed during the first part of the NewFISP project, other sequences have been developed in 2 others projects funded by national french agency ANR (ultra-short TE sequences for tissue engineering evaluation, and whole body MR sequences for tumor molecular imaging).

The NewFISP project has been reinforced by a second PhD student.

The post-doctoral researcher recruited in the NewFISP project (Emeline Ribot) has obtained a permanent position at the CNRS (competition with 4 positions per year for approximately 150 applicants).

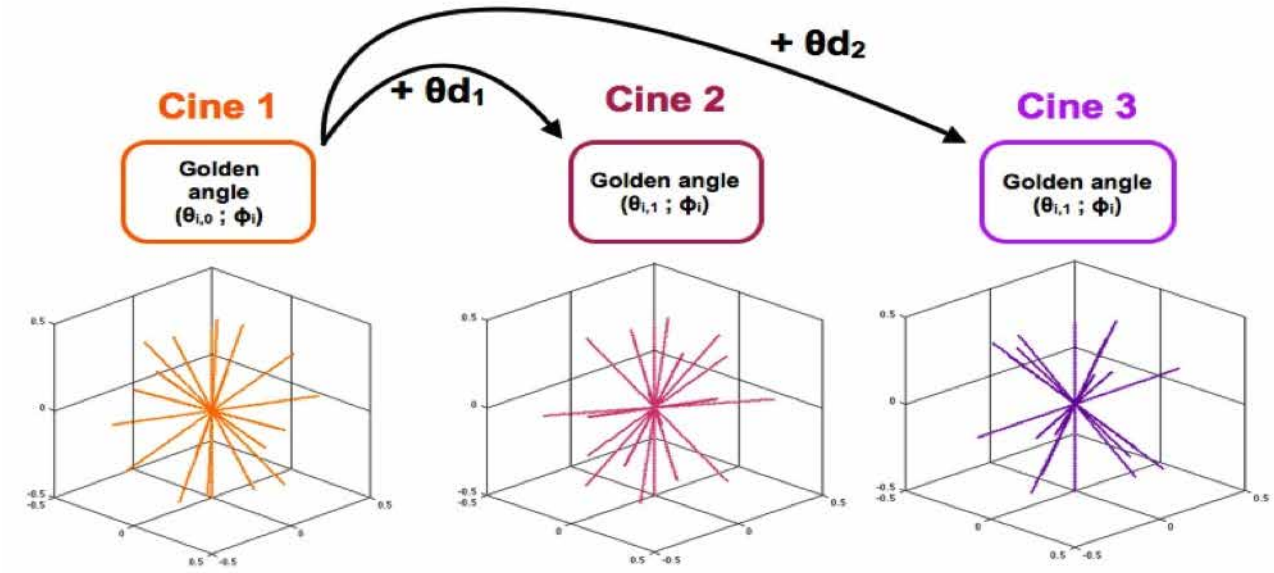


Fig : 3D double golden angle encoding scheme for cine MR angiography.

WP3: dynamic nuclear polarization

The work package « Dynamic Nuclear Polarization » is divided in two separate approaches: in situ DNP and dissolution DNP.

a) In situ DNP

In situ DNP can be done in vivo in mice at 0.2T as seen from Overhauser-enhanced MRI of stable nitroxides. Proteolytic activity was recently spotted in vivo using a home-made design of an Overhauser switch. Work is in progress to design modified nitroxides to assess specifically abnormal proteolysis (inflammation, cancer). Translation to the clinical practice shall strongly depend upon the possibility of funding new class of MRI instruments at low-fields. In situ DNP publications (work funded by TRAIL):

- Alkoxyamines: toward a new family of theranostic agents against cancer. Moncelet D, Voisin P, Koonjoo N, Bouchaud V, Massot P, Parzy E, Audran G, Franconi JM, Thiaudière E, Marque SR, Brémond P, Mellet P. Mol Pharm. 2014 Jul 7;11(7):2412-9.
- In vivo Overhauser-enhanced MRI of proteolytic activity. Koonjoo N, Parzy E, Massot P, Lepetit-Coiffé M, Marque SR, Franconi JM, Thiaudiere E, Mellet P. Contrast Media Mol Imaging. 2014 Sep;9(5):363-71.
- Overhauser-enhanced MRI of elastase activity from in vitro human neutrophil degranulation. Parzy E, Bouchaud V, Massot P, Voisin P, Koonjoo N, Moncelet D, Franconi JM, Thiaudière E, Mellet P. PLoS One. 2013;8(2):e57946

New classes of nitroxides are being developed in collaboration with the UMR 7273, Marseille (Institute for Radical Chemistry). These molecules can display various EPR signature as a function of their ionization state. Such molecules shall be evaluated in vitro as of their ability to provide an Overhauser switch. The selected probes are aimed to be coupled to peptide substrates and evaluated in the frame of proteolysis detection.

Of note, year 2015 shall be a crossroads : the research activity is at the total dependency of the renewal of the open-magnet low field MRI system which should take place in 2015 in a new building: indeed, the current MRI site will be retired and reconverted, with no possibility of moving the old low-field MRI system.

b) Dissolution DNP

Dr Silvia Rizzitelli has been recruited as a postdoctoral fellow in July 2014 (project Oncoflux funded in 2014). The polarization of metabolites such as pyruvate has been demonstrated and in vivo protocols are currently implemented in small animals. The main objectives remain the investigation of metabolic diseases (lung and brain cancer in the Oncoflux project) and the investigation of brain metabolism.

The application of hyperpolarized substrates will remain focused on the investigation of tumor cells and brain metabolism. In order to initiate a translational research program on the 3T whole-body MRI magnet to be installed in the IBIO building, it is reminded that these translational studies require multi-nuclei imaging configuration and capabilities for this research MRI scanner.

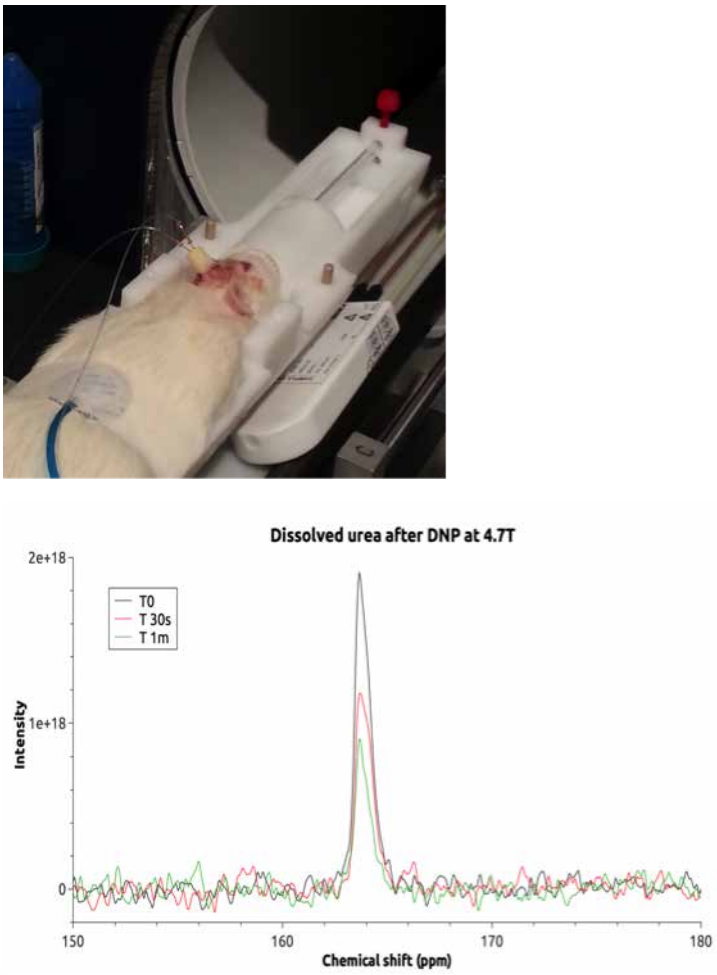


Figure : NMR and MRI of rat brain using micro-dialysis probe (left image). NMR acquisitions from hyperpolarized metabolites (right plot).

WP4: tracers and contrast agents

The purpose of the Work Package 4 is to develop tools to synthesize molecules or modified biomolecules and to use them as imaging agents in the framework of projects whose translational character is more or less marked, particularly in the areas of oncology and neurology.

It is important to note that the chemistry developed upstream mainly concerns the molecular covalent and coordination chemistry. Other areas such as nanoparticles for instance are not covered by the Labex TRAIL. Nevertheless, this point could be the subject of inter Labex collaborative projects

The WP4 has actually founded four research projects (two federative and two emerging) for a total amount of 474k€ since the end of 2011.

PIAF (119 k€ in 2011 and 45k€ in 2014) concerns the development of a new silicon based F18 labelling technic of peptides then applied to the PET Imaging of angiogenesis by 18F-RGD and finally used for the in vivo evaluation of a novel anti angiogenic agent (Dendrogenine A).

IMMELAPT (250 k€ in 2012) concerns the synthesis of innovative aptamers recognizing a human protein (MMP9) overexpressed in tumours, then their labelling for ex vivo and in vivo imaging.

SUPSIFLU (30 k€ in 2013) aims to develop a new 18F labelling strategy on solid support that may be applicable to a wide range of biological molecules.

PRITOR (30 k€ in 2013) concerns the imaging of neuropeptide receptors for tumour targeting.

Furthermore, the contribution of TRAIL Labex has also facilitated the internationalization of these projects by facilitating exchanges with partners (INMAS, New Delhi, India and Aarhus University, Denmark). Currently 3 out of 4 projects are directed toward potential applications of imaging in oncology. Only SUPSIFLU which is a very early stage project could be in a second phase directly applied to other topics of interest for TRAIL such as neurology. It should be noted that none of the current projects concerns the multi modal imaging. In a reflection on the future evolution of WP4, it became obvious that this dimension should be integrated and promoted in future projects

WP5: biological bio-imaging markers

Selected WP5 projects have covered Neurology, Oncology and Cardiology themes. The distribution was made as follows: four projects in Neurology funded up to 661,000 €, one project in Oncology funded up to 35,000 € and one project in Cardiology funded up to 195,000 €.

Each project fosters the development of translational research from the targeting of a physiological process, a cell or a molecule involved in pathologies to the implementation of the focused bio-imaging in humans. WP5 funding in LabEx TRAIL gave rise to publications and grants. More importantly, the support of LabEx TRAIL impacted on the future and allowed the leverage of additional funds and industrial partnerships.

To define biomarkers of pathophysiological events

1-Focusing on functional connectivity of cerebral structures involved in Anxiety Disorders including post-traumatic stress disorders (PTSD)

Transfear : Translational study of the cerebral substrates involved in pathological fear recovery 130,000€

Transfear proposal aims at identifying the changes in functional connectivity of cerebral structures involved in relapse of fear behavior (such as dysregulation of medial prefrontal cortex - basolateral amygdala functional interaction), using electrophysiological recordings in rodents and functional Magnetic Resonance Imaging (fMRI) technique in humans performed with a 3T MRI magnet. A 3T neuroimaging in healthy humans represents the best and the most precise available tool to deeply investigate the functional relationships within the cerebral networks of interest. Elucidating the neural mechanisms mediating pathological fear recovery should further suggest novel therapeutic strategies for anxiety disorders characterized by a high propensity to relapse such as PTSD.

Partners of Transfear are :

- TRAIL team : UMS CNRS 3428, Plateforme de BioImagerie, Univ Bordeaux (Dr. M. Bonnet, Research Unit of Pr. V. Dousset)
- Non TRAIL teams : INSERM U862, Univ Bordeaux (Dr C. Herry) ; INSERM U862, Univ Bordeaux (Pr. B. Aouizerate); USR CNRS 3413, Univ Bordeaux (Pr. P. Philip)

Added value of TRAIL funding :

- InterLabEx project (with BRAIN)

Current scientific activities and results:

- In animals: Simultaneous recordings of several brain regions were carried out in a group of 7 animals.
- In humans: Difficulties were encountered in the management of equipements due to the need of using electric currents (for stimulation) in an MRI environment. Agreements were obtained from the Regional Ethics Committee and the National Agency of Drug Safety (ANSM). Volunteer recruitment is under way.

2-Focusing on brain gray and white matter in multiple sclerosis

SCI-COG & REACTIV : Imaging biomarkers of brain gray and white matter in multiple sclerosis cognitive impairment

130,000€

The aim of this project is to determine which MRI parameters could be used as a biomarker to predict cognitive deficiencies (mainly information processing speed (IPS) and memory) which occur at the early stages of MS (high-risk clinically isolated syndromes (CIS)). These MRI parameters could be further used to predict the responsiveness of MS patients to cognitive rehabilitation.

Two clinical researchs are involved:

- The SCI-COG program (240K€) study the correlations between cognitive disorders and markers of brain disconnection in MR imaging.
- The REACTIV program (240K€) studies the cognitive rehabilitation in Multiple Sclerosis and assessment by neuroimaging. This study promoted by CHU de Bordeaux is on-going.

Added value of TRAIL funding :

- Project part of Clinical Research protocols : SCI-COG and REACTIV funded by Teva, ARSEP and Merck-Serono laboratories

Current scientific activities and results:

- A Bio imaging Engineer (Fanny Munch) was recruited to use/ to program Software (SPM, FSL and freesurfer) for imaging processing. The imaging analysis protocol on the lesion segmentation method was implemented. In the SCI-COG study, 17 patients with a clinically isolated syndrome and 5 healthy volunteers were included. A rate of 5 patients and 5 healthy volunteers included per month was expected. As part of the REACTIV study, 10 patients and 19 healthy volunteers have been included.

3-Focusing on microscopic water movements and diffusion-weighted imaging

IBIO-NI : Imaging Biomarkers of experimental and clinical neuroinflammation

251,036€

IBIO-NI proposes to study

(1) lateral diffusion along the astrocyte membrane of a water channel protein, aquaporin 4 (AQP4), and its regulation; (2) microscopic water movements within cells during focal brain inflammation induced by pro-inflammatory cytokines in order to identify new biomarkers for tissue integrity characterization using new high-sensitivity Diffusion Tenser Imaging (DTI), MR Diffusion kurtosis Imaging (DKI) and Diffusion Spectrum Imaging (DSI). Water movement through AQP4 is one of the biological substrate that underlies MR signal modification with the diffusion-weighted imaging technique; (3) the mechanisms of cognitive impairment in MS using DTI, fMRI and Voxel based morphometry (VBM); (4) large cohorts of MS patients (OFSEP) and controls (I-Share) to validate MRI markers.

Partners of IBIO-NI are :

› TRAIL teams: U1049 INSERM (K. Petry): Brochet, Tourdias, Ruet, Deloire, Dousset, Petry ; CNRS UMR 5536 (Franconi): Hiba, Konsman

› Non TRAIL teams: CNRS UMR 5297 (Choquet) Groc ; U862 INSERM (Plazza) Oliet ; U708 INSERM (Tzourio): Tzourio, Kurtz

Added value of TRAIL funding :

› Collaboration with Teva; InterLabEx project (with BRAIN); Impact on the recruitment of doctorants, ATER, Research Engineers

Current scientific activities and results :

› A postdoctoral fellow, Silvia CIAPPELLONI, was recruited in November 2013 to perform the cultures of hippocampal neurons. A collaboration with Pr Honorat (Inserm U1028/CNRS5292, Lyon) was initiated for the use of a human antibody against Aquaporin-4 (AQ4) to study the activity dependence of AQ4 diffusion and its coupling with GLT-1.

› Development of DSI sequence (Q space) and animal model in order to Identify novel biomarkers based on water diffusion parameters allowing a better characterization of tissue alterations during local inflammation in white and gray matter. Recruitment and evaluation of MS patients in the OFSEP cohort and of controls in the i-Share cohort to understand whether voxel-based cerebral morphometry measures differ in patients with MS according to the presence and severity of depression compared with healthy matched controls.

4- Focusing on molecular imaging of astrocytic lactate in brain activation and hypoxia

InNES : Role of astrocytic lactate in neuronal metabolism: implication during brain activation and neuroprotective effect in neonate cerebral hypoxia.

149,971€

The aim of InNES project is to characterize a lactate shuttle between astrocytes and neurons during brain activation. Ex vivo experiments aim at directly analyzing metabolism on brain biopsies using Nuclear Magnetic Resonance (NMR) at High Resolution at the Magic Angle Spinning (HR-MAS) spectroscopy after perfusion of 13C-labeled substrates in awake rats in activated conditions and in rats in which MCT2 (neuronal monocarboxylate transporter) is silenced (to determine the role of MCT2 in the transfer of astrocytic lactate to neurons). In vivo experiments aim at following in real-time brain lactate by localized NMR spectroscopy and molecular imaging of lactate at 7T during stimulation. Experiments on neonate model of brain hypoxia will study lactate administration as a neuroprotective therapeutic tool.

Added value of TRAIL funding :

› Development of scientific basic knowledge's in neuroscience and in vivo spectrometry

› Translational research (collaboration with J-F. Chateil (Children hospital, Bordeaux)

› International collaborations and attraction for top-notch neuroscientists: L. Pellerin from Lausanne, who was a pioneer in the ANLSH theory and G. Bonvento working in MIRCen lab (CEA, Fontenay-aux-Roses) directed by P. Hantraye.

Current scientific activities and results :

› The air puff system for whisker stimulation in and outside the magnet was constructed. Cerebral activation was visualized by autoradiographic images of control and MCT2 -down regulated rats. 1H- and 13C-NMR spectra and specific enrichments of metabolites in the activated and non-activated barrel field samples of control and MCT2 -down regulated rats clearly indicate an increase in intracerebral lactate production from blood glucose during neuronal activation. No increase of lactate can be demonstrated in rats MCT2, showing for the first time the role of MCT2 in the metabolic coupling between neurons and astrocytes.

The NMR spectra acquired at 7T in control rats show an increase in lactate during activation, no longer detected in rats lacking MCT2. In vivo experiments conducted in InNES project determine lactate coming from the astrocytes as an important neuronal energetic substrate. An important and promising outcome concerns neuroprotective strategies. Indeed, functional brain imaging has shown that several neurodegenerative diseases are characterized by metabolic impairments that often precede the onset of the symptoms.

5- Focusing on molecular imaging of biomarkers of atherosclerosis using human antibodies

MIMATHUMAB: Molecular IMaging of ATHeroma with HUMan AntiBody

195,000€

MIMATHUMAB project focuses on molecular imaging of atherosclerosis, using human antibody discovery for high quality functionalization of nanoparticles dedicated to safe and non-invasive magnetic resonance imaging (MRI) or magnetic particle imaging (MPI) and for radiolabeling with 18F or 68Ga for positron emission tomography (PET). Nowadays, there is an increasing interest in molecular imaging of atherosclerosis, in order to assess the cellular components that underlie the risk of rupture of vulnerable plaques, precipitating the clinical conditions of stroke and myocardial infarction. Molecular imaging requires highly sensitive and specific affinity ligands for targeting. MIMATHAMAB project aims to (1) engineer recombinant human single chain Fv (scFv) antibodies (Abs) designed to target vulnerable plaques, (2) functionalize imaging devices with scFv antibodies, (3) achieve molecular imaging by MRI, MPI and PET on new ApoE-/- mouse models of atherosclerosis and plaque rupture.

Partners of MIMATHUMAB are:

› TRAIL team: UMR 5536, Molecular Targeting of Atheroma Group;

› Non TRAIL Teams: UPR 9048, ICMCB (E. Duguet: AMADEus); Baker IDI Heart and Diabetes Institute (C. Hagemeyer)

Added value of TRAIL funding :

› Translational research: a panel of human Abs using in vivo phage-display technology selected in animal models were shown to target human atherosclerotic tissues, thus likely to be used from pre-clinical to clinical studies. If some of these human antibodies were shown to recognize biomarkers involved in inflammation, these could be easily translated to other systemic pathologies, such as neurological disorders and cancers; InterLabEx project (with AMADEus); International collaboration with Baker IDI Heart and Diabetes Institute leading to an IdEx grant for PhD; Project part of GDR n° 3260 "Anticorps et ciblage thérapeutique", FLI (France Life Imaging) WP1; Leverage of additional funds: ANR ATHERANOS, CRA doctoral fellowship, IdEx funding; Leverage of industrial partnerships: LFB Biotechnologies (Rémi Urbain), Brüker Biospin MRI GmbH (Nicoleta Baxan ; MPI technology)

Current scientific activities and results :

› Human antibodies (Abs) previously selected by phage display have been produced in large-scale in Pichia Pastoris, insect cells, mammalian cells under different Ab formats (ScFv, scFv-Fc, scFv-Fab'2, IgG) to meet the needs for efficient grafting to imaging agents. IgG and scFv Abs have been used to functionalize Versatile USPIO (VUSPIO) nanoparticles for MRI and MPI applications. Different platforms of scFv-VUSPIO were constructed, increasing the number of scFv grafted per VUSPIO . Reactivity was found to be gradually improved in fonction of the number of Abs. High-resolution ex vivo MRI and fluorescence approaches (ViVoptic platform) demonstrated a selective binding of Ab-VUSPIO on murine atheroma plaques. Promising preliminary in vivo MRI studies will be improved with the recruitment of a post-doctorant via TRAIL funding. PET studies will be performed with 68Ga-labelled Abs. The biotechnologies developed around these human Ab will constitute the basis for developing new clinical tools dedicated to molecular imaging and therapy of human atherosclerosis in collaboration with LFB Biotechnologies, a new partner of the ANR project ATHERANOS.

6- Focusing on fluorescence and ultrasound imaging of small prostate tumors

BiopsyProstaProbe : Development of antibody-based fluorescence probe for biopsy guidance of prostate cancer

35,000€

BiopsyProstaProbe proposed to combine fluorescence imaging to the ultrasound imaging currently used in clinic, in order to detect small prostate tumors making possible to guide the transrectal biopsy . The goal of the current project is to develop a fluorescescent probe based on a labeled antibody, a scFv anti-PSMA antibody, provided by Italians collaborators . This scFv is known to specifically targeted in vivo subcutaneous tumor in mice. To test the probe in physiopathological context as close as possible of clinical conditions, the project proposed to develop a prostate cancer model using mouse RM1 cells in immunocompetent mice. RM1 cells will be genetically modified to express both human PSMA and imaging reporter genes in order to test labeling specificity. Completion of the current project will open avenue for translational application of ScFv fragment for biopsy guidance of prostate cancer.

That's why this innovative way of the project has appeared in directly coupling the scFvD2B fragment to a near infrared fluorophore.

Partners of BiopsyProstaProbe are:

› TRAIL team: RMSB, UMR 5536, équipe Imagerie & Cancer, F. Couillaud & N. Grenier

› Non TRAIL team: University of Verona, Italy, G. Fracasso & M. Colombatti

Current scientific activities and results :

› The project will start with the recruitment of MAZZOCCO Claire in January 2015

General Conclusion:

Learning from physiological, cellular or molecular events occuring in pathologies to predict disease progression, prognosis and evaluate therapeutic intervention will continue to be the major axes of WP5. Targeting cellular or molecular events for such purposes implies the development of targeted contrast agents and a closer link with projects developed in WP4.

WP6: mathematical simulations and modeling

The general aim of this work package is to couple modeling tools from computer science and mathematics with imaging modalities in order to exploit all the information included in the images. In order to optimize the resources and to create new synergies, we drive this program jointly with the cluster CPU of the IDEX Bordeaux http://cpu.labex.u-bordeaux.fr. The goal of CPU is to develop digital sciences and their applications to other sciences. CPU is organized in three axes (scientific computing; signal and image processing; reliability, networks and data management). The three axes contribute to the TRAIL program and there is a growing community of researchers that are concerned with this interaction through the WP 6 of TRAIL. Concerning specifically WP6, we have mainly focused on three aspects:

i) The first one is the use of longitudinal, multi-modal data in oncology. The goal is to be able to obtain patient specific predictions of the evolution of a lesion or the response to a treatment using morphologic image (like CT-scans or MRI) and functional imaging (perfusion MRI, TEP F-miso...). Special care will be given to the evaluation of the effects of anti-angiogenic therapies for the renal cell carcinoma. We will take advantage of the presence in Bordeaux of specialists of clinical oncology, functional imaging, biologists and mathematicians in order to enhance the translational aspect of this study.

ii) The second aspect concerns representation, simulation and statistical modeling of multivariate, multimodal, neuroimaging data. Cohort studies including neuroimaging data have become one the most advanced tool of modern neuroscience. Such studies usually combine acquisition in large groups of subjects of multivariate data, namely socio-demographic, lifestyle, biological including genetic, psychometric, and multimodal neuroimaging, including structural, functional, metabolic and molecular. The objectives of these studies maybe, for example, the understanding of the relationships between brain and behavior, uncovering the risk factors of some disease, or improving current diagnostic methods. These multiple, ongoing or about to start, cohorts ran by TRAIL core and associated teams, offer the unique opportunity of designing and testing the feasibility of mathematical and/or statistical models of brain functioning and of is major disorders.

iii) The third point concerns Cardiac electrophysiology numerical modeling based on multimodal imaging information. It is mainly driven by the IHU and even if the researchers are involved explicitly in TRAIL and CPU, we will omit the report on this part that is mainly founded by the IHU.

Below, we give an exhaustive description of the projects that have been founded by TRAIL and CPU in order to show the activity of this new community that has been induced by the two LabEx. These projects are driven jointly by computer scientists, medical doctors and mathematicians in order to achieve the translational mission of TRAIL.

1) CRYOIMMUNO. F. Cornelis (CHU), funded by TRAIL. With the CRYOIMMUNO clinical trial, we would like to evaluate the impact of the combination of cryoablation and immune-modulation. We hypothesize that this strategy will confer long-term immunity, and ultimately cure, by exploiting the biology of the tumor and the immune system of the affected individual. We would like to propose clinically this hypothesis in patients who already benefited in routine practice of a cryoablation and required the development of novel therapeutic strategies in order to improve the standard of care and life expectancy. To adequately validate this hypothesis, our study requires developing a reliable methodology of evaluation: imaging and immunologic explorations will assess the therapeutic response and may improve the understanding of the mechanisms involved.

2) Bronchial segmentation on MRI. F. Baldacci (LaBRI) and F. Laurent (CHU). The main goal of this project is to develop new image analysis methods aiming to enable the use of MRI for characteristic measurements of bronchial diseases. Those measurements are only available on CT scan data up to now. The work is divided in two parts:

- Noise reduction of the MRI image by frequential filtering in k-space before reconstruction plus a geometrical filtering on morphological image.
- Lumen and bronchial wall segmentation in order to do a quantitative analysis of the bronchial tree.

The long-term goal of this work is to realize some diagnostics without requiring ionizing acquisition technique.

3) Advanced statistical methods for analysis of multidimensional databases of human brain imaging B. Mazoyer (GIN), J. Sarraco (INRIA). Funded by IDEX on the interlabex problem.

The project focuses on the analysis of variability factors driving hemispheric specialization (HS) of the brain, a human specific character, for which a dedicated database has recently been built by GIN ((Neurofunctional Imaging Group from L).

GIN provides the database and performs genotyping of fifty loci potentially affecting HS. The "Probability and Statistics" group (EPS) from the LabEx CPU works on the methodological developments of statistical tools (dimension reduction approaches, clustering, statistical modeling) to analyze these high dimensional data. Interactions between GIN and EPS allow to identify and to characterize the best variables, to perform additional analyses, and to suggest appropriate additional variables, especially in the case of the voxel being implemented. GIN is also involved in the interpretation of the statistical results

generated throughout the project.

Dr Solveig Badillo has been hired as Postdoctoral researcher in may 2014 on this project for 20 months.

4) Derivation of a phenomenological predictive mathematical model of hippocampal activity. A. Iollo (INRIA), G. Marsicano (Magendie), funded by CPU. One of the most daunting challenges in neurosciences is the ability to visualize and quantitatively analyze the activity of defined intact neuronal circuits. In this project we plan to use advanced experimental methods and novel numerical models based on partial differential equations (PDEs) to provide a systematic interpretation and modeling of distributed neuronal activity information.

The main source of experimental data is Voltage-sensitive dye imaging (VSDI). This technique offers the great advantage of direct visualization of dynamic neuronal activity in acute brain slices in physiological and pathological conditions. The dynamic images provided by this technique could in principle be analyzed by conventional point-wise statistical methods. However, considering the spatial nature of the time-resolved data available, we have the possibility to provide a much deeper understanding of the distributed neuronal activity observed thanks to VSDI data. To this aim, we have developed a computational method based on the solution of an optimal transportation problem that is used to derive precise information on velocity fields, direction, spatial spreading and morphological constraints of stimulated neuronal activity in hippocampal circuits. This approach represents a novel and rational method to obtain several specific parameters describing in detail the modes of diffusion of depolarization signals in brain slices.

Thanks to this model-based VSDI data analyses, we study specific mechanisms of depolarization signal diffusion in the hippocampus and build a phenomenological PDE model of these events. We chose to use advanced genetic and pharmacological tools to interfere with the activity of specific (CB1) receptors, in order to build an experimental database to derive a phenomenological predictive mathematical model of hippocampal activity based on VSDI data. An engineer will be hired in 2015.

5) MOD. Th. Colin (INRIA), F. Cornelis (CHU), J. Palussière (Bergonié), funded by TRAIL, co-funding by the Région Aquitaine. The aim of this project is to propose mathematical models for evaluating the response to anti-angiogenic drugs using functional imaging. The ultimate goal of this approach will be to be able to propose numerical tools in order to predict the evolution of the growth of a tumor or its long-term response to a treatment using the early response, measured through functional imaging.

The methodology is the following one: we start by writing a mathematical model (using a set of partial differential equations) that relies on a mechanistical description of the tumor growth. Usually, this model will involve a set of "free" parameters (less than 10) that are unknown and to be determined. Then we check that this model is able to describe, at least qualitatively, the behaviors that are observed on longitudinal series of CT-scans or MRI. At this point two strategies are available:

a) The first one consists in trying to describe the features of the image (as for example the texture of the image of the tumor) through the model in order to explain the effect of the drugs. For example, it is well known that the effect of anti-angiogenic drugs may not only be observed on the change of shape of the tumor but also on its constitution. Using series of longitudinal data, we will try to highlight new numerical markers evaluating the long-term response to the therapy.

b) The second approach will be to provide patient-specific prognosis: we try to find the «best» values of the parameters that allow to match with the series of imaged by solving an optimization problem; then me make a prediction using this set of parameters. This strategy has been successfully used for evaluating the aggressiveness of lung metastases without treatment in the team MC2 of T. Colin.

We will develop this methodology in two directions. The first axis is devoted to NSCLC and brain metastasis and the second one to kidney cancers and lung metastasis. We will develop below the specificity in terms of imaging of both axes.

A. Peretti has been hired as PhD student (co-funded by the region) in October 2014.

6) Abnormality Detection using Sparse-based Modeling of Brain Anatomy: Application to Alzheimer's Disease. P. Coupé (LaBRI), M. Allard (INCIA), funded by CPU. The detection of anatomical abnormalities of brain characteristics between a studied population and the normal anatomy is an important aspect of current research on brain. Automatic detection of such abnormalities enables to link structural brain changes to cognition scores or clinical symptoms. In this project we propose: (i) to present the new concept of sparse-based morphometry (SBM) to better represent the complexity of local anatomical pattern, (ii) to combine voxel-based morphometry (VBM) and SBM in order to simultaneously analyze modification of local mean of gray matter (GM) density and alteration of shape and geometry of local GM pattern, and (iii) we evaluate the propose framework on the ADNI dataset (N=814).

Dr Thach Thao Duong has been hired as Postdoctoral researcher the 1st October 2014 on this project for 14 months.

7) Toward an in-vivo ultra-high resolution diffusion MRI platform: Application to multiple sclerosis. P. Coupé (LaBRI), T. Tourdias (Magendie). Funded by CPU. Diffusion weighted (DW) imaging enables the reconstruction of information revealing the microstructure of the brain. Despite its interesting properties, DW imaging is an inherently low signal-to-noise ratio (SNR) technique and yields to relatively poor spatial resolution.

In this project we will propose new denoising and super-resolution methods to enable ultra-high resolution (UHR) DTI. Such UHR DWI can enable a new in-vivo insight of brain architecture and can be useful for a large range of pathologies. Moreover, we will develop a fully automatic platform for UHR DTI in order to process the large amount of data produced by our collaborators. Finally, a validation of the proposed platform will be carried out on a large dataset of patient with multiple sclerosis.

This project did not start yet. A co-funding LabEx BRAIN proposed by T. Tourdias has been accepted on this topic.

8) Kidney. N. Grenier (CHU), Th. Colin (INRIA), B. Taton (CHU and INRIA). Funded by CPU. While renal function value and trends determine nephrologists' all-day therapeutic decisions, the tools used to assess these quantities still require improvements. Magnetic Resonance Imaging (MRI) allows the functional evaluation of anatomic zones of the kidney. In renal functional MRI (fMRI) the kidney is modeled as compartments between which substances are exchanged. These flows may be assessed by studying the kinetics of the MRI signal following gadolinium injections. Topographic maps of renal blood flow, blood volume, glomerular filtration rate and other parameters of interest may be derived from these models. In chronic kidney diseases, the physiological status of each kidney zone might be evaluated.

Models for the prediction of tumoral growth may be enriched to account for physiological knowledge concerning the kidney. The algorithms used to estimate the parameters of the resulting partial differential equations remain valid and may be fed with the functional maps obtained by fMRI studies. This work intends to provide clinicians with new tools to investigate topograhic maps of the renal function and predict its evolution. B. Taton (MD) has been hired as post-doc since nov. 2014.

9) Meningiomas. O. Saut (INRIA, H. Loiseau (CHU), G. Kantor (Bergonié). Funded by CPU. To start in 2015. We plan to run on meningioma the same program than that we have on lung metastasis. The aim is to estimate the growth in the future using a longitudinal sequence of MRI of one patient. An engineer will be hired in 2015.

WP7: cohort imaging methodology

The main streamline of TRAIL-WP7 research is the development of advanced automated algorithms for processing large image datasets produced by cohort studies.

Five projects have been funded by TRAIL since 2011.

TRAIL&TRACKS is a stem-based tractography algorithm for DTI data that has been developed and is in a validation phase. ABACI is a neuroanatomical analysis pipeline, now in its final development phase, that is already implemented and used for processing the MIBRAIN cohort. The 3 other projects have just started : COBRASCAN aims at developing quantitative CT analysis of lung parenchyma analysis for the COBRA cohort, while ABACI2 and PACA will extend the ABACI pipeline for processing intrinsic FMRI data and developing a probabilistic atlas of cortical areas, respectively.

Also falling within WP7 framework is the organization of an international summer school dedicated to methods in CONNECTOMICS.

Annex 1 to 17

Annex 1

WHO references for public health issues

- **Cancer**
  - www.who.int/mediacentre/factsheets/fs297/en/
  - http://globocan.iarc.fr/Default.aspx
- **Cardiovascular diseases**
  www.who.int/mediacentre/factsheets/fs317/en/
- **COPD**
  www.who.int/mediacentre/factsheets/fs315/en/
- **Neurological disorders**
  www.who.int/mediacentre/news/releases/2007/pr04/en/
- **Impact of air pollution**
  www.who.int/mediacentre/news/releases/2014/air-pollution/en/
- **Ageing in Europe**
  http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Population_structure_and_ageing

Annex 2

International Master BioImaging

The objective of this training is to master theoretical concepts and practical know-how of the main bio-imaging techniques.

The Master is supported by 2 LabEx: LabEx BRAIN (Bordeaux Région Aquitaine Initiative for Neurosciences) and LabEx TRAIL (Translational Research and Advanced Imaging Laboratory). Researchers from LabEx BRAIN will teach neurosciences, including cellular imaging, and researchers from LabEx TRAIL will teach medical imaging. The Master was launched in 2012 and had 15 students in 2013 and 10 in 2014.

Annex 3

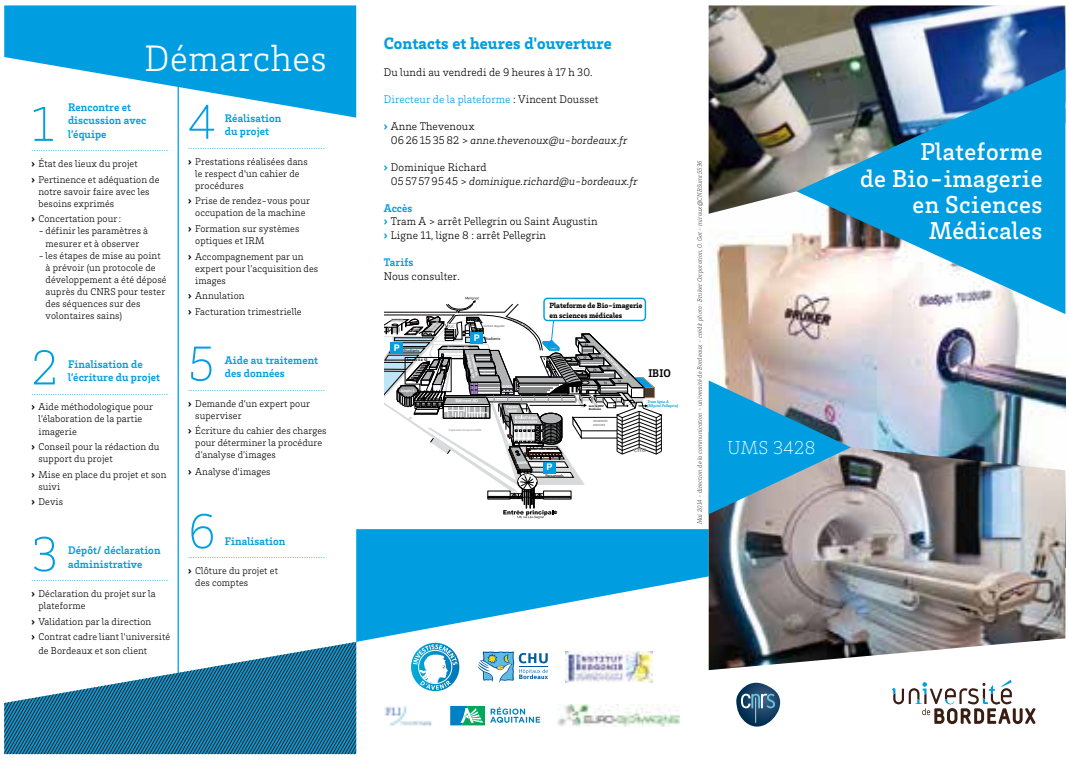
Core partners web sites

CORE PARTNER	WEB SITE
Institute of Molecular Sciences (ISM, UMR5255)	http://www.ism.u-bordeaux1.fr/
Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536)	http://www.rmsb.u-bordeaux2.fr/
Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045)	http://www.univ-bordeauxsegalen.fr/fr/recherche/acteurs-de-la-recherche/biologie-fondamentale-et-appliquee-a-la-medecine/centre-de-recherche-cardio-thoracique-de-bordeaux---crctb.html
"Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862)	http://www.neurocentre-magendie.fr/NCM_Pages/UK_index.php
Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287)	http://www.incia.u-bordeaux1.fr/
Neurofunctional Imaging Group (GIN, UMR5296)	http://www.gin.cnrs.fr/?lang=en
Bordeaux Institute of Mathematics (IMB, UMR5251)	http://www.math.u-bordeaux.fr/imb/spip.php
"Neuroinflammation, imaging and therapy of multiple sclerosis" Inserm unit U1049	http://www.inb.u-bordeaux2.fr/dev/FR/equipe.php?equipe=Neuroinflammation,%20imagerie%20et%20th%E9rapie%20de%20la%20Scl%E9rose%20en%20Plaques-Equipe%20associ%E9e

Annex 4

Two imaging platforms in Bordeaux:

a) UMS-CNRS-3428



b) PTIB: ptib.u-bordeaux2.fr

Annex 5

14 Steering Committee members

TRAIL DIRECTOR
Vincent DOUSSET

LABORATORIES'REPRESENTATIVES	
Institute of Molecular Sciences (ISM, UMR5255)	Éric FOUQUET
Centre of Magnetic Resonance of Biological Systems (RMSB, UMR5536)	Jean-Michel FRANCONI
Bordeaux Cardio-Thoracic Research Centre (CRCTB, U1045)	Patrick BERGER
"Physiopathology of neuronal plasticity" Inserm unit (Magendie Institute, U862)	Bruno BROCHET
Aquitaine Institute of Cognitive and Integrative Neurosciences (INCIA, UMR5287)	Michele ALLARD
Neurofunctional Imaging Group (GIN, UMR5296)	Bernard MAZOYER
Bordeaux Institute of Mathematics (IMB, UMR5251)	Thierry COLIN
"Neuroinflammation, imaging and therapy of multiple sclerosis" Inserm unit U1049	Klaus PETRY

MEDICAL FIELDS'REPRESENTATIVES	
Neurology	Bassem HIBA
Oncology	Jean PALUSSIERE
Cardiology	Bruno QUESSON
Pneumology	François LAURENT
Nephrology	Nicolas GRENIER

Annex 6

Presentation to IDEX Bordeaux by Director of TRAIL, june 2014

TRAIL
Public health issues and role of imaging

université de BORDEAUX

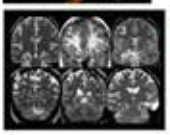
Public health issues

- Aging of population and evolution of environmental factors go hand in hand with increased risk of diseases:
  - Cardiovascular diseases (heart attack, stroke…)
    - 17 M of deaths, 30% of world wide mortality (WHO)
  - Cancer (lung, colon, breast, stomach, liver)
    - 8,2M of deaths
  - Respiratory diseases (lower respiratory tract infections, COPD)
    - 6,2M of deaths
  - Neurological disorders (Alzheimer, Parkinson, MS, neuroinfection) :
    - 6,8M of deaths
- These public health risks and their economic impacts are attracting the attention of public policymakers and will increase the need for prevention, diagnosis and personalized therapeutic monitoring

Role of imaging

- Diagnosis

- Surgery guidance



- Treatments monitoring (imaging biomarkers)

Imaging benefits

- Non invasive
- Prevention
- Personalized medicine
- New treatment evaluation
- High industrial valorization potential (G.E., Siemens, Philips, bcp de PME)

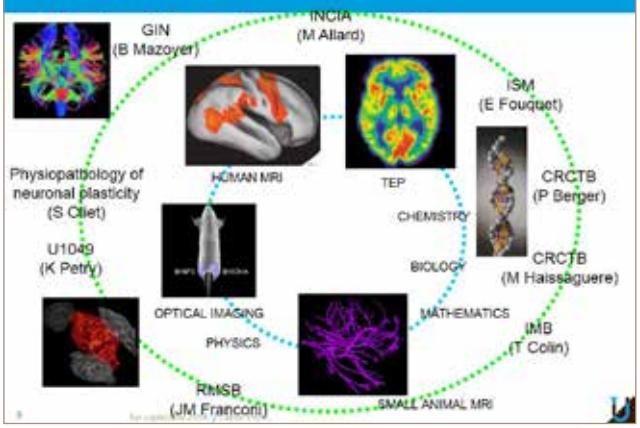
TRAIL
Today

université de BORDEAUX

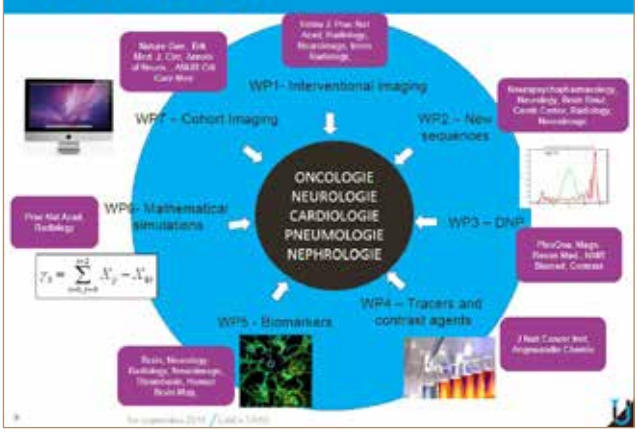
TRAIL laboratories

- 8 laboratories from Bordeaux involved in:
  - Public health issues
  - Cross-sectional research
  - Translational research

TRAIL laboratories



TRAIL work packages



Bio Imaging platform (UMS3428-IBIO)

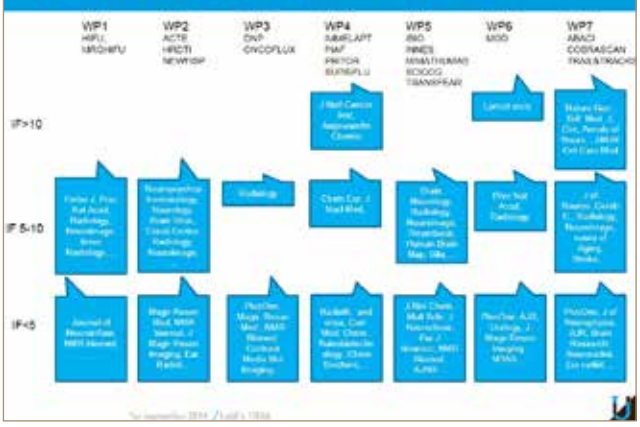
- 6 optical systems
- 3 small animal MRI (7,05T, 4,7T, 0,2T)
- 3 human MRI (0,2T, 3T)
- 2 HIFU systems
- 1 TEP-TDM

TRAIL 2011-2013 developments

- Research
  - 3 calls for proposals, 20 research projects granted
    - 2,34M€
    - All federative projects received a double « A » grade from international reviewers
  - 12 new collaborators
    - 3 post-doctoral fellowships, 7 doctoral fellowships, 2 engineers
    - Coming from: Australia, Canada, France, Italy
  - 19 academic collaborations
    - UTAH, Boston, Stanford, Sherbrooke, Amsterdam, Wisconsin, New York, Valence, Lauzanne, Washington
    - Building of a national network with « FLI » (Paris, Grenoble, Marseille, Lyon, Toulouse)
  - 5 projects financed by IDEX
    - 1 InterlabEx project: Labex TRAIL - Labex CPU : 134K€
    - 3 International post-doctoral fellowships: 150K€
    - 2 Mobility grants :
      - Thomas Cornilleau (E Fouquet - Denmark Aarhus, 5 months): 3350 €
      - Janice Hou (J. Petit - Canada Sherbrooke, 3 months): 3800 €
    - 3 Invited professors:
      - Pr. Charles Guilman (University of HARVARD, USA); Pr. Dennis Parker (University of UTAH, USA); Pr. Mishra (Tulanne University, India); Pr. Troels SKRYDSTRUP (Aarhus University, Danis radiomanipage)
    - 2 Summerschools projects

TRAIL 2011-2013 developments: Publications

TRAIL 2011-2013 developments: Publications



TRAIL 2011-2013 developments

- Cofunding:
  - Public funding 2012-2013 : 2.9M€
    - ANR, Plan Cancer, ITN PI Net, AGSEP, Idex Bordeaux
  - Industrial funding 2012-2013 :
    - 630K€ (TEVA, Merck Serono, Unither, Sanofi, GSK, Intrasense)
    - Engineers made available for TRAIL projects by Siemens, Brüker, Philips, IGT SA
- Dissemination
  - 25 talks in international congresses (Japan, Argentina, Germany, India, Croatia, USA, Spain, France, ...)
  - 5 international speakers in Bordeaux in 2013 coming from the CITA Alzeihmer Center Spain, the Johns Hopkins University USA, the University of Pittsburg USA, the University of Oxford
  - A symposium in Bordeaux « Image guided therapy and diagnosis » in 2013
- Training
  - 2 Seminars in 2012
  - 2 Summerschools projects (Connectomics 2014, Neuroinflamation Imaging 2015)

TRAIL 2011-2013 developments

- Governance
  - Calls for proposals
    - 4 calls for research projects, 2 calls for post doctoral fellowship
    - 42 reviewers (2011-13)
    - 20 research projects (2.34M€)
  - 25 Steering Committee
  - 1 « Comité des Tutelles »
  - 1 Scientific Advisory Board (nov 2014)
  - 1 Consortium Agreement

TRAIL 2011-2013 developments

Strengths

- Major public health themes: neurology, oncology, cardiology, pneumology, nephrology
- Multidisciplinarity on the same site (chemistry, biology, imaging, mathematics), collaboration clinician-researchers
- Performance of teams: grades A+/A from the AERES assessment agency, 48% of scientific articles from the TRAIL community are published in journals with an impact factor over 5
- 2 technological platforms (UMS-CNRS-3428, PTIB) and one dedicated building (IBIO, in 2014)
- A lasting budget of 9M€ over 9 years (2011-2019)
- Attractiveness: academic collaborations, industrial collaborations, institutional co-financing, post-doc and doctoral student recruitments
- Large community: 170 people (86 researchers, 17 postdocs, 25 engineers, 24 doctoral students, 8 technicians, 10 administrative staff)
- Training programs: 2 summer schools, International Bioimaging Master's Program, links with the School of Neurosciences FENS-IBRO
- Strong governance: Consortium Agreement, monthly meetings of the Steering Committee,

Weaknesses

- Numerous research subjects: 7 work packages et 5 medical fields
- Industrial development
- International visibility
- Varied communities
- Protectionism regarding the composition of the LabEx
- Recruitments to be made lasting over time

Opportunities

- Aligning research with national, international and European research strategies (H2020/ Kic ageing)
- Varied research ecosystem: Pellegrin CHU, Institut Bergonié (oncology), ISPED (epidemiology), Neurocampus, Institut National de Recherche en Informatique, Laboratoire Bordelais de Recherche en Informatique, Institut Hospitalo Universitaire LYRIC (cardiology) and Equipex MUSIC, ARNA (study of RNA), LabEx,
- UMS-CNRS-3428 platform, regional node for France Life Imaging
- Historical support from the Conseil Régional d'Aquitaine (co-financing of equipment and research projects, communication), regional networks: Cluster TIC SANTE (1st health computer cluster in France), Route des Lasers, BIPSA
- Growth strategy of the University of Bordeaux: merging of 3 universities, connecting with the Université du Pays Basque, IDEX Bordeaux, ranking in the international classification of universities
- the Aquitaine region is attractive for international relations; « Euroregion » (Aquitaine-Pays Basque)
- CPER 2014-2020

Threats

- Competitive themes
- Cost of equipment (maintenance, renewal)
- Regional and national industrial imaging scene
- Structure of the next five-year research plan

TRAIL
Translational research

université de BORDEAUX

ONCOLOGY — WP1 : MR Guided HIFU

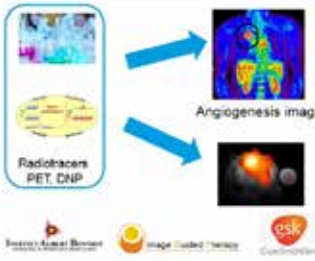
Less risk
Less expensive

THE UNIVERSITY OF UTAH — UNITHER — Image Guided Therapy

ANR, LYRIC, CRAquitaine, IGT SA, Unither

Major Publications since 2009 :
IF 5-10 : Radiology, Invest Radiol, Proc Natl Acad Sci USA, NeuroImage

ONCOLOGY — WP 4 : Tracers and contrast agents



Earlier diagnosis
Non invasive

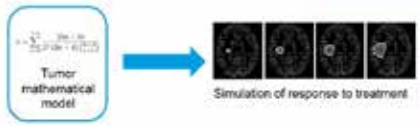
Inserm

ANR, MENRT grant, Inserm, ITN PI-NET

2 post doctoral fellowships

Major Publications since 2009:
IF 5-10 : Chem Eur. J, J. Nucl Med Mol Imaging
Molecules, European Journal of Organic Chemistry, ChemPlusChem

ONCOLOGY — WP 6 : Mathematic simulation and modeling



Personalized medicine
Prevention
Therapeutics

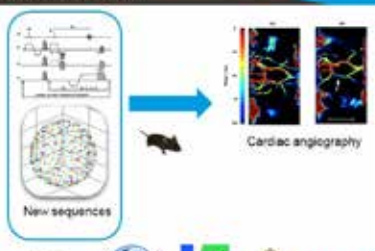
Inserm — SIEMENS — Institut Bergonié — CNRS

Plan Cancer, INRIA, Siemens

1 engineer, 1 post doctoral fellowship

Major publications since 2009:
IF>10 : Lancet Oncology
IF 5-10 : Diagnostic and interventional imaging, J Magn Reson Imaging, PLoS One

CARDIOLOGY — WP2 : New Sequences



Performance
Diagnosis

BRUKER — GE — WISCONSIN

ANR TecSAN

1 post doctoral fellowship, 2 doctoral fellowship, 3 trainees

Major publications since 2009 : IF 5-10 : Radiology
Magnetic Resonance in Medicine, 2014

NEUROLOGY — WP 2 : New sequences

Personalized medicine
Prevention
Performance

SIEMENS — UNIVERSITÉ DE SHERBROOKE — ITACA (Espagne)

Major publications since 2009 :
Neuroimage, PLoS One, Front aging Neuro. (2013)

NEUROLOGY — WP 5 : Biological Bio-imaging Markers

Treatment evaluation

- Personalized medicine
- Performance
- Prevention

HARVARD UNIVERSITY — CHU — TEVA — MERCK SERONO

- 1 invited professor: Charles Guttman (Harvard)
- 1 engineer
- Major publications since 2009 :
  IF 5-10 :Neurology, Human Brain Mapp, Multiple Sclerosis

NEUROLOGY — WP 7 : Cohort Imaging methodology

Automated post processing for cohort imaging

Clinical data (phenotypes)

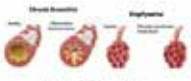
- Prevention
- Risk factors

Human Connectome Project — University of Washington

- I-Share cohort ; BBS cohort ; 3 cities ; AMI
- 1 post doctoral fellowship, 2 engineers, 1 doctoral fellowship
- Major publications since 2009 :
  IF>10 : Annals of Neurology, British medical Journal, Nature Genetics

PNEUMO — WP 7 : Cohort Imaging methodology

postprocessing



BPCO biomarkers

- Prevention
- Risk factor

intrasense® — CHU — CNRS

- Intrasense
- Major publications since 2009 :
  IF>10 : Am J Respir Crit Care Med
  IF>5 : Radiology

International competition

NEUROLOGY

Paris Diderot — Boston Children's Hospital — Harvard — Yale New Haven Hospital — Texas — UT Health Science Center — Aix-Marseille — Human Connectome Project

ONCOLOGY

Universität Bern — Paris Sud — ETH — Irvine

CARDIOLOGY PNEUMOLOGY

Utrecht — Toronto — Amsterdam — Philips — Geneva — Mount Sinai Hospital — Paris Diderot — COPD Journal — Europe

TRAIL Strategy

université de BORDEAUX

TRAIL Strategy

2011-13 : Organizing

- Building governance (consortium agreement, calls for proposal, management)
- Developping the research matrix
- Developping communication

2014-16: international development

- « Consolidation » program
- Associate team program
- Post-doctoral fellowship, summerschools, SAB

TRAIL Strategy

TRAIL OBJECTIVES	STRATEGY	PROGRAM	2011-2013 BUDGET	2014-2019 BUDGET
COMPETITIVE RESEARCH	Existing research projects reinforcement	Post-doctoral fellowship program	200 000 €	900 000 €
		Research Program		1 350 000 €
	New research projects	Federative or emerging research program	2 339 000 €	1 620 000 €
	Collective action	New equipment	58 000 €	420 000 €
COMMUNITY AND INTERNATIONAL VISIBILITY	Multidisciplinarity of the community	Summerschool, training	66 000 €	300 000 €
	Scientific animation	International speakers, lectures,...	9 000 €	114 000 €
	Administration of the cluster	Human ressources, general assembly, running costs	177 000 €	622 000 €
	Attractiveness	International program: associate team, visiting scholars, mobility,...		300 000 €
		Trainee		137 000 €
		TOTAL per period	*2 849 000 €*	*5 763 000 €*
		TOTAL		*8 612 000 €*

Annex 7

International reviewers' organizations

COUNTRY	ORGANIZATION
Belgium	Cliniques Universitaires St Luc
Canada	Calgary University
	Institut universitaire en santé mentale de Québec
	Lawson Health Research Institute
	Montreal Neurological Institute
	Sunnybrook Research Institute
	UBC Chemistry Dpt
	Université de Sherbrooke, Département de médecine nucléaire et de radiobiologie
	Western University, Robarts Research Institute
Germany	Heidelberg University
	Muenster University, Institute for Clinical Radiology, Translational Research Imaging Center (TRIC)
	Tuebingen University
Hong Kong	University of Hong Kong
India	Indian Institute of Technology Bombay
Israel	The Weizmann Institute of Science, Rehovot, Israel
Italy	Univ Florence, Dpt Chemistry
Japan	Kyoto University
	Osaka City University Graduate School of Medicine, Department of Radiology
Luxembourg	CRP SANTE
Netherlands	MCBI VU medical center
Russia	Moscow State University, faculty of physics
Switzerland	École Polytechnique Fédérale de lausanne EPFL
	Université de Genève
	Université de Lausanne
UK	Aberdeen university
	FMRIB Centre, John Radcliffe Hospital
	Imperial College Healthcare NHS Trust
	Institute of cancer research, division of radiotherapy and imaging
	MRC Clinical Sciences Center, Imperial College, Londres
	Sheffield University
	University of Oxford
USA	Department of Radiology UTSouthwestern Medical Center, Dallas
	Harvard University
	Mayo Clinic
	Mount Sinai School of Medicine
	National Cancer Institute
	New York University School of Medicine
	The Houston Methodist Hospital
	Tufts University, Sackler School of Graduate biomedical Sciences, Boston
	Mayo Clinic
	UCLA School of Medecine, Laboratory of Neuro Imaging
	UCSB
	Univ of Washington, Center on Human Development and Disability
	University of Minnesota, College of Science and engineering
	University of Texas
	University of Virginia
	University of Washington
	Novartis Institute for Biomedical Research

Annex 8

TRAIL budget details (2011-2014)

NUMBER OF PROJECTS	2011	2012	2013	2014	Total
Federative	3	4	4		11
Doctoral Fellowship	2				2
Emerging		5	2	3	10
Total	**5**	**9**	**6**	**3**	**23**

BUDGET PER YEAR	2011	2012	2013	2014	Total	
Federative	298 971 €	1 001 036 €	634 448 €		1 934 455 €	61%
Emerging		150 000 €	60 000 €	105 000 €	315 000 €	10%
Doctoral Fellowship	195 000 €				195 000 €	6%
Consolidation				220 000 €	220 000 €	7%
Postdoctoral fellowship			200 000 €	300 000 €	500 000 €	16%
Total	493 971 €	1 151 036 €	894 448 €	625 000 €	3 164 455 €	
	16%	36%	28%	20%	100%	

Budget per CorePartner	Federative	Doctoral Fellowship	Emerging	Consolidation	Postdoctoral fellowship	Total	
UMR 5536 (RMSB)	479 971 €	97 500 €	95 000 €	110 000 €	300 000 €	1 082 471 €	34%
UMR 5296 (GIN)	250 000 €	97 500 €		65 000 €	100 000 €	512 500 €	16%
INSERM U1049	381 036 €		30 000 €			411 036 €	13%
UMR 5287 CNRS (INCIA)	250 000 €		60 000 €			310 000 €	10%
U1045 (CRCTB)	274 448 €		35 000 €			309 448 €	10%
IMB	180 000 €		35 000 €			215 000 €	7%
UMR5255 (ISM)	119 000 €		30 000 €	45 000 €		194 000 €	6%
INSERM U862			30 000 €		100 000 €	130 000 €	4%
Total	1 934 455 €	195 000 €	315 000 €	220 000 €	500 000 €	3 164 455 €	

Budget per project	Federative	Doctoral Fellowship	Emerging	Consolidation	Postdoctoral fellowship	Total	
ABACI	250 000 €			65 000 €	100 000 €	415 000 €	13%
IBIONI	251 036 €					251 036 €	8%
NEWFISP	250 000 €					250 000 €	8%
IMMELAPT	250 000 €					250 000 €	8%
MIMATHUMAB			30 000 €	65 000 €	100 000 €	195 000 €	6%
ONCOFLUX	180 000 €					180 000 €	6%
MOD	180 000 €					180 000 €	6%
PIAF	119 000 €			45 000 €		164 000 €	5%
INNES	49 971 €				100 000 €	149 971 €	5%
TRAILDNP		97 500 €		45 000 €		142 500 €	5%
MRGHIFU	140 000 €					140 000 €	4%
COBRASCAN	134 448 €					134 448 €	4%
SCICOG&REACTIV	130 000 €					130 000 €	4%
HRDTI			30 000 €		100 000 €	130 000 €	4%
TRANSFEAR			30 000 €		100 000 €	130 000 €	4%
TRAIL&TRACKS		97 500 €				97 500 €	3%
CRYOIMMUNO			35 000 €			35 000 €	1%
BIOPSYPROSTAPROBE			35 000 €			35 000 €	1%
NEKOMRI			35 000 €			35 000 €	1%
PRITOR			30 000 €			30 000 €	1%
SUPSIFLU			30 000 €			30 000 €	1%
ACTE			30 000 €			30 000 €	1%
HIFU			30 000 €			30 000 €	1%
Total	**1 934 455 €**	**195 000 €**	**315 000 €**	**220 000 €**	**500 000 €**	**3 164 455 €**	**100%**

Annex 9

Comparison between TRAIL objectives and first results

OBJECTIVES (2011-2019)	RESULTS (2011-MID 2014)
Improving imaging science	› 23 research projects covering 80% of the medical themes and 100% of the work packages of the TRAIL research matrix › 9,4M€ dedicated to research over 2 years (TRAIL: 3,164M€; co-financing: 6,2M€) › 100% federative projects graded « A » by external reviewers; 48 international reviewers mobilized since 2011 › 202 publications of the community on TRAIL research themes since 2012, 11 international speakers in Bordeaux, 21 academic collaborations
Developing translational research	› Translational research projects › The CHU and the Institut Bergonié support clinical trials › The Steering Committee is composed of researchers and clinicians
Interacting with the industry	› 15 industrials involved in TRAIL research projects › 551K€ of direct financial contribution from the industry › Collaboration with the SATT, the Conseil Régional d'Aquitaine (Aquitaine Développement Innovation, Cluster TIC Santé, Route des Lasers), and with the Bordeaux University Foundation for the showcasing of TRAIL in regional and national industry › Communication media (internet website, brochures, kakemono), and promotion of the LabEx to industrialists (RSNA 2012, ISMRMB 2013, JFR 2012/2013, B4B; see annex 15)
Promoting training	› 202 publications and 150 scientific communication since 2012 › 1 summerschool in 2014 › Annual doc/post-doctoral fellowship programs › 3 mentoring actions in 2012 (1 seminar, 1 symposium, 1 mobility) › 8 trainees in 2 years › Links with the Bioimaging Master's Program; links with the FLI network
Establishing a strong governance	› Consortium Agreement between 5 institutional tutors › Monthly Steering Committee (26 meetings), Trustee Committee (1 en 2012), Annual General Assembly (2011, 2012, 2013) › Procedures for calls for proposals › Annual reporting to ANR, Idex Bordeaux › 2 full-time positions dedicated to developing the LabEx

Annex 10

Recruitments and community

a) Recruitments

2011-2013 RECRUITMENTS

Function	Name	Beginning of contract	End of contract	Project
3 Post Doctoral fellowships	Emeline RIBOT	2014	2018	NEWFISP (Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases)
	Pierre-Yves HERVE	2013	2013	ABACI (Automated Brain anatomy softwares for cohort imaging)
	Silvia CIAPPELLONI	2013	2015	IBIO-NI (New Imaging Biomarkers of neuroinflammation such as MS)
2 Engineers	Gaelle LEROUX	2013	2013	ABACI (Automated Brain anatomy softwares for cohort imaging)
	Fanny MUNSCH	2012	2015	SCICOG REACTIV (Imaging biomarker in MS)
7 Doctoral fellowships	Charles CASTETS	2013	2016	NEWFISP (Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases)
	Laurent ADUMEAU	2013	2016	MIMATHUMAB (Molecular Imaging of Atheroma with Human Antibody)
	Mélusine LARIVIERE	2013	2016	MIMATHUMAB (Molecular Imaging of Atheroma with Human Antibody)
	Thomas CORNILLEAU	2013	2016	PIAF (18F for PET-imaging angiogenesis)
	Aurélien TROTIER	2012	2015	NEWFISP (Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases)
	Janice HAU	2012	2015	TRAIL&TRACKS (Atlasing white matter tracts)
	Neha KOONJOO	2012	2015	TRAILDNP (To improve in vivo DNP in mice at 0.2 T)
8 Master Trainees	Laurie VEREMES	2013	2013	ACTE (Cognitive training and brain functional connectivity)
	Tom DURIEZ	2013	2013	NEWFISP (Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases)
	Kris VAN RENTERGHEM	2013	2013	NEWFISP (Improving MRI resolution to correctly MRI-diagnose cardiac pathologies and metastases)
	Denys SAMPOL	2013	2013	INNES (Lactate and neuronal metabolism)
	Alexandre POUSSARD	2013	2013	MIMATHUMAB (Molecular Imaging of Atheroma with Human Antibody)
	Aude GUILLEMET	2013	2013	PIAF (18F for PET-imaging angiogenesis)
	Annie RUELLE	2013	2013	PIAF (18F for PET-imaging angiogenesis)
	Charlène DUPRE	2013	2013	IBIO-NI (New Imaging Biomarkers of neuroinflammation such as MS)
2 Administrative staff	Jean-François BAUGER	2011	2015	TRAIL GOVERNANCE
	Iris LEMOINE	2012	2015	TRAIL GOVERNANCE

b) Community

Number of persons per laboratory

LABORATORY	NUMBER OF PERSONS	%
U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)	52	31%
UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)	37	22%
UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)	31	18%
UMR 5296 (GIN: Neurofunctional Imaging Group)	18	11%
INSERM U1049 (Neuroinflammation, imaging and therapy of MS)	11	6%
UMS 3428	10	6%
UMR5255 (ISM: Bio-active molecules and synthesis team)	9	5%
INSERM U862 (Magendie Institute: Pathophysiology of neuronal plasticity)	2	1%
Total	170	100%

TRAIL COMMUNITY

NAME	PRENOM	FONCTION	ORGANIZATION
ADUMEAU	Laurent	Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
ALLANIC	Marianne	Post Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
ALLARD	Michèle	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
ALLARD	Benoit	Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
ARSAC	Laurent	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
ASSUDRE	Sylvie	Administrative staff	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
BAUGER	Jean-François	Administrative staff	UMS 3428
BEAUVIEUX	Marie-Christine	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BENOIST	David	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
BERGER	Patrick	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
BERLANDE	M.	Technician	UMR5255 (ISM: Bio-active molecules and synthesis team)
BERNARD	Charlotte	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
BERNUS	Olivier	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
BEZANCON	Eric	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BIRAN	Marc	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BOIZIAU	Claudine	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
BONNET	Mélissa	researcher/teacher	UMS 3428
BORDOCHAR	Pierre	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
BOSSARD	Jérome	Administrative staff	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
BOUCHAUD	Véronique	Technician	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BOURDEL-MARCHASSON	Isabelle	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BOUZIER-SORE	Anne-Karine	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
BRISSAUD	Olivier	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
BROCHET	Bruno	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
BUDISAVLJEVIC	Sanja	Post Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
CARON	Jerome	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
CARVALHO	Gabrielle	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CASSAGNO	Nadège	Technician	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
CASTETS	Charles	Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
CATHELINE	Gwenaelle	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
CAZALETS	Jean-rené	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
CHAIGNE	Sebastien	Technician	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CHANSEAU	Christel	Engineer	UMS 3428
CHAPOLARD	Mathilde	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CHATEIL	Jean-François	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
CHOUKROUN	Marie-Luce	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CIAPPELLONI	Silvia	Post Doctoral Fellowship	INSERM U862 (Magendie Institute: Pathophysiology of neuronal plasticity)
CLOFENT-SANCHEZ	Gisèle	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
COCHET	Hubert	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CONSTANTIN	Marion	Technician	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
CORNILLEAU	Thomas	Doctoral Fellowship	UMR5255 (ISM: Bio-active molecules and synthesis team)
COUILLAUD	Franck	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
CREMILLIEUX	Yannick	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
CRIVELLO	Fabrice	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
DEBELLEIX	Stephane	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DELOIRE	Mathilde	Engineer	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
DERVAL	Nicolas	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DESCHODT-ARSAC	Veronique	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DESPLANTEZ	Thomas	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DETAILLE	Dominique	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DILHARREGUY	Bixente	Engineer	UMS 3428
DIOLEZ	Philippe	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)

NAME	PRENOM	FONCTION	ORGANIZATION
DOISY	Isabelle	Administrative staff	UMR5255 (ISM: Bio-active molecules and synthesis team)
DOS SANTOS	Pierre	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DOURNES	Gael	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DOUSSET	Vincent	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
DUBES	Virginie	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
DURIEZ	Quentin	Post Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
ELBES	Delphine	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
EMILIEN	Aurélie	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
FAYON	Michael	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
FELPIN (REMPLAÇANT EN AVRIL 2012)	Félix	researcher/teacher	UMR5255 (ISM: Bio-active molecules and synthesis team)
FERNANDEZ	Philippe	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
FLAVIER	karine	Administrative staff	UMR5255 (ISM: Bio-active molecules and synthesis team)
FORO	Anita	Administrative staff	UMR 5296 (GIN: Neurofunctional Imaging Group)
FOUCHET	Sandrine	Post Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
FOUQUET	Eric	researcher/teacher	UMR5255 (ISM: Bio-active molecules and synthesis team)
FRANCONI	Jean-Michel	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
GALLIS	Jean-Louis	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
GARRIGUES	P.	researcher/teacher	UMR5255 (ISM: Bio-active molecules and synthesis team)
GILBERT	Steve	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
GIN	Henri	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
GIRODET	Pierre-Olivier	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
GRENIER	Nicolas	researcher/teacher	UMS 3428
HAISSAGUERRE	Michel	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
HAMEL	Delphine	researcher/teacher	INSERM U862 (Magendie Institute: Pathophysiology of neuronal plasticity)
HAU	Janice	Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
HAUGER	Olivier	researcher/teacher	UMS 3428
HENRIQUES	Benedicte	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
HERVE	Pierre-Yves	Post Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)
HESLING	Isabelle	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
HIBA	Bassem	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
HILBERT	Gilles	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
HINDIE	Elif	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
HOCINI	Mélèze	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
HUSKY	Mathilde	Post Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
JACOBIN-VALAT	Marie-Josée	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
JAIS	Pierre	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
JOBARD	Gaël	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
JOIN-DELAVY	Dominique	Administrative staff	UMS 3428
JOLIOT	Marc	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
KANTOR	Guy	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
KENNEL	Sybille	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
KONSMAN	Jan-Pieter	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
KOONJOO	Neha	Post Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
LAGADEC	Saioa	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
LAMARE	Frédéric	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
LARIVIERE	Mélusine	Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
LASTERE-ITCAINA	Fabienne	Administrative staff	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
LAURENT	François	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
LAURENT JOYE	Mathieu	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
LE NOST	Pierre	Engineer	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
LEDERLIN	Mathieu	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
LEROUX	Gaelle	Engineer	UMR 5296 (GIN: Neurofunctional Imaging Group)
LOISEAU	Hugues	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
LUDWIG	Mickael	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MARIE	Damien	Post Doctoral Fellowship	UMR 5296 (GIN: Neurofunctional Imaging Group)

NAME	PRENOM	FONCTION	ORGANIZATION
MARTHAN	Roger	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
MASSOT	Philippe	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
MAURAT	Elise	Technician	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
MAYO	Willy	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MAZERE	Joachim	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MAZOYER	Bernard	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
MELLET	Emmanuel	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
MERLE	Mathilde	Engineer	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
MERLIN	Thibaud	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MIRAUX	Sylvain	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
MISDRAHI	David	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MISHRA	Anil Kumar	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
MIZANI	Lebna	Administrative staff	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
MONTAUDON	Michel	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
MUNSCH	Fanny	Engineer	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
OTTONES	Florence	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
OUSOVA	Olga	Engineer	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
OZIER	Annaïg	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
PARZY	Elodie	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
PASDOIS	Philippe	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
PELLETIER	Amandine	Doctoral Fellowship	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
PERCHEY	Guy	Engineer	UMR 5296 (GIN: Neurofunctional Imaging Group)
PETIT	Laurent	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
PETRY	Klaus	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
PFEUTY	Micha	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
PIANET	I.	Engineer	UMR5255 (ISM: Bio-active molecules and synthesis team)
PLOUX	Sylvain	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
QUESSON	Bruno	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
RADAT	Françoise	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
RAFFARD	Gerard	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
RIBOT	Emeline	Post Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
RIES	Colette	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
RIGALLEAU	Vincent	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
RITTER	Philippe	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
ROULAND	Richard	Technician	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
SACHER	Frederic	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
SANCHEZ	Stephane	Technician	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
SCHULZ	Jurgen	Engineer	UMS 3428
SCHWEITZER	Pierre	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
SHAH	Ashok	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
SIBON	Igor	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
SWENDSEN	Joël	researcher/teacher	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
SZLOSEK	M.	researcher/teacher	UMR5255 (ISM: Bio-active molecules and synthesis team)
TEDESCHI	Iris	Administrative staff	UMS 3428
THAMBO	Jean-Benoit	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
THIAUDIERE	Eric	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
THUMEREL	Matthieu	Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
TOURDIAS	Thomas	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
TRAINEAU	Jeanny	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
TRIAN	Thomas	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
TRILLAUD	Hervé	researcher/teacher	UMS 3428
TROTTIER	Aurélien	Doctoral Fellowship	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
TUNON DE LARA	Manuel	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
TZOURIO-MAZOYER	Nathalie	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)
VAILLANT	Fanny	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
VALEINS	Henri	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)

NAME	PRENOM	FONCTION	ORGANIZATION
VARGAS	Frederic	researcher/teacher	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
VIAUD	Karine	Engineer	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
VIGNES	Jean-Rodolphe	researcher/teacher	INSERM U1049 (Neuroinflammation, imaging and therapy of MS)
VIMONT	Delphine	Engineer	UMR 5287 CNRS (INCIA: Neurofunctional and Cognitive Imaging Team)
VOISIN	Pierre	researcher/teacher	UMR 5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)
WALTON	Richard	Post Doctoral Fellowship	U1045 (CRCTB: Cardio-Thoracic Research Center of Bordeaux)
ZAGO	Laure	researcher/teacher	UMR 5296 (GIN: Neurofunctional Imaging Group)

Annex 11

Research collaborations

WP	APPLIED MEDICAL FIELD	PROJECT	RESEARCH	YEAR OF CORE PROJECT	LEADER	TRAIL GRANT (3,164M€)	COLLABORATION WITH BORDEAUX TEAM	COLLABORATION WITH FRENCH TEAM	COLLABORATION WITH INTERNATIONAL TEAM
7	Neuro	ABACI	Automated Brain anatomy softwares for cohort imaging	2012	MAZOYER (UMR 5296 (GIN))	415 000 €	UMR5287, U1049, U708, U897	-	Washington University USA (HCP)
2	Neuro	ACTE	Cognitive training and brain functional connectivity	2012	CHANRAUD (UMR 5287 CNRS (INCIA))	30 000 €		-	SRI International
5	Onco	BIOPSYPROS-TAPROBE	Development of antibody-based fluorescence probe for biopsy guidance of prostate cancer	2014	COUILLAUD (UMR 5536 (RMSB))	35 000 €			University of Verona (Fracasso & Colombatti)
7	Pneumo	COBRASCAN	Quantitative computed tomog. for phenotyping COPD within COBRA cohort	2013	LAURENT (U1045 (CRCTB))	134 448 €			
6	Onco	CRYOIMMUNO	Cryo immunotherapy of metastatic renal carcinoma	2014	CORNELIS (IMB)	35 000 €	CHU Bordeaux, INCIA, UMR 5164 (CIRID)		
1	Onco	HIFU	Alteration of the blood brain barrier induced by HIFU	2012	PETRY (INSERM U1049)	30 000 €	U1045, UMR5536, UMR5297, U862	-	-
2	Neuro	HRDTI	Developping High-Resolution DTI method	2012	HIBA (UMR 5536 (RMSB))	130 000 €	LABRI	-	University of Sherbrooke, Universidad de Valencia
5	Neuro	IBIONI	New Imaging Biomarkers of neuroinflammation such as MS	2012	BROCHET (INSERM U1049)	251 036 €	UMR5536, UMR5297, U862, U708, CHU Bordeaux OFSEP	Université Aix-Marseille, U1028 Lyon	BICAMS group (Europe, USA), MAGNIMS Network, MS CENTER Amsterdam, Buffalo University NY, Royal Holloway London
4	Onco	IMMELAPT	Detecting tumors using SPECT molecular imaging and optimized aptamers	2012	TOULME (UMR 5287 CNRS (INCIA))	250 000 €	U869 (ARNA), INCIA	LPCML Lyon, UMR5260 Dijon	-
5	Neuro	INNES	Lactate and neuronal metabolism	2011	BOUZIER (UMR 5536 (RMSB))	149 971 €	INCIA	MIRcen Fontenay aux Roses	UNIL-IP Lausane
5	Cardio	MIMATHUMAB	Molecular Imaging of Atheroma with Human Antibody	2012	CLOFENT-SANCHEZ (UMR 5536 (RMSB))	195 000 €	UPR9048, U869 (ARNA), AMADEUS	UPS3044	Baker IDI Melbourne
6	Onco	MOD	Mathematical modeling of the response to antiangiogenic drugs	2013	COLIN (IMB)	180 000 €	RMSB, CHU, INCIA, Bergonié, U1029		
1	Onco, cardio	MRGHIFU2	Methodological developments for HIFU app. in cardiology and oncology	2013	QUESSON (U1045 (CRCTB))	140 000 €	Bergonié, RMSB, UMR 5234		University of Utah
6	Pneumo	NEKOMRI	MRI sequence for bronchial wall segmentation and analysis	2014	BALDACCI (U1045 (CRCTB))	35 000 €	LABRI		
2	Cardio	NEWFISP	Improving MRI resolution to correctly MRI-diagnose cardiac/onco patho.	2012	MIRAUX (UMR 5536 (RMSB))	250 000 €	LABRI, IMB, U1029, Bergonié, IHU LIRYC	-	UNIVERSITY OF WISCONSIN
3	Onco, neuro, pneumo	ONCOFLUX	Metabolic flux MR imaging in tumors	2013	CREMILLIEUX (UMR 5536 (RMSB))	180 000 €		UJF Grenoble U823	
4	Onco	PIAF	18F for PET-imaging angiogenesis	2011	FOUQUET (UMR5255 (ISM))	164 000 €	UMR5287, UMR5805	EA3035 Toulouse (pharmaco anticancéreux) UMR1037 Toulouse (cancéro)	-
4	Onco	PRITOR	NeuroPeptide Receptors Imaging for TumOR Targeting	2013	HINDIE (UMR 5287 CNRS (INCIA))	30 000 €	Bergonié		INMAS (NewDehli India)
5	Neuro	SCICOG&REACTIV	Imaging biomarker in MS	2011	DELOIRE (INSERM U1049)	130 000 €	CHU Bordeaux, INCIA	Université Aix-Marseille	Magnims Network, Buffalo University NY, Royal Holloway London
4	Onco	SUPSIFLU	Supported Silyl Fluorination	2013	HERMANGE (UMR5255 (ISM))	30 000 €			
7	Neuro	TRAIL& TRACKS	Atlasing white matter tracts	2011	PETIT (UMR 5296 (GIN))	97 500 €	ISHARE	-	University of Ferrara, Italy
3	Neuro	TRAILDNP	To improve in vivo DNP in mice at 0.2 T	2011	THIAUDIERE (UMR 5536 (RMSB))	142 500 €		UMR6264 Aix Marseille (Chimie)	
5	Neuro	TRANSFEAR	Cerebral structure changes involved in pathological fear recovery	2012	BONNET (INSERM U862)	130 000 €	UMS34285, U862, USR3413 (SANPSY BRAIN)	-	FRIEDRICH MIESCHER INSTITUTE

Annex 12

Co-funding

APPLIED MEDICAL FIELD	PROJECT	RESEARCH	YEAR OF CORE PROJECT	LEADER	TRAIL GRANT (3,164M€)	PUBLIC COFUNDING (5,644M€)	PRIVATE COFUNDING (0,551M€)
Neuro	ABACI	Automated Brain anatomy softwares for cohort imaging	2012	MAZOYER (UMR 5296 (GIN))	415 000 €	440K€= I-Share (410K€ pour engineer), BBS PHRC (30K€ pour engineer)	
Neuro	ACTE	Cognitive training and brain functional connectivity	2012	CHANRAUD (UMR 5287 CNRS (INCIA))	30 000 €	4K€ (EPHE)	
Onco	BIOPSYPROSTAPROBE	Development of antibody-based fluorescence probe for biopsy guidance of prostate cancer	2014	COUILLAUD (UMR 5536 (RMSB))	35 000 €	15K€ ANR BITUM (15K€)	
Pneumo	COBRASCAN	Quantitative computed tomog. for phenotyping COPD within COBRA cohort	2013	LAURENT (U1045 (CRCTB))	134 448 €		INTRASENSE (51459€)
onco	CRYOIMMUNO	Cryo immunotherapy of metastatic renal carcinoma	2014	CORNELIS (IMB)	35 000 €	15 K€ (GSO)	
Onco	HIFU	Alteration of the blood brain barrier induced by HIFU	2012	PETRY (INSERM U1049)	30 000 €	-	UNITHER (130K€)
Neuro	HRDTI	Developping High-Resolution DTI method	2012	HIBA (UMR 5536 (RMSB))	130 000 €	-	
Neuro	IBIONI	New Imaging Biomarkers of neuroinflammation such as MS	2012	BROCHET (INSERM U1049)	251 036 €	37K€=ITN Marie Curie (37K€)	
Onco	IMMELAPT	Detecting tumors using SPECT molecular imaging and optimized aptamers	2012	TOULME (UMR 5287 CNRS (INCIA))	250 000 €	-	
Neuro	INNES	Lactate and neuronal metabolism	2011	BOUZIER (UMR 5536 (RMSB))	149 971 €	-	
Cardio	MIMATHUMAB	Molecular Imaging of Atheroma with Human Antibody	2012	CLOFENT-SANCHEZ (UMR 5536 (RMSB))	195 000 €	578K€= ANRSVSE5 (440K€), Melbourne (25K€), TECSAN (25K€), ICMCB (24K€), BAKER IDI (25K€)	
onco	MOD	Mathematical modeling of the response to antiangiogenic drugs	2013	COLIN (IMB)	180 000 €	906K€= Plan Cancer (758 k€), INRIA (50 k€), Bordeaux 1 (98 k€)	
onco, cardio	MRGHIFU2	Methodological developments for HIFU app. in cardiology and oncology	2013	QUESSON (U1045 (CRCTB))	140 000 €	1357K€= ANR "TACIT" (905 k€; FLI (400K€), IHU LIRYC, CRA (52 k€)	
pneumo	NEKOMRI	MRI sequence for bronchial wall segmentation and analysis	2014	BALDACCI (U1045 (CRCTB))	35 000 €		
Cardio	NEWFISP	Improving MRI resolution to correctly MRI-diagnose cardiac/onco patho.	2012	MIRAUX (UMR 5536 (RMSB))	250 000 €	1540K€= ANR SIMI8 (700K€), ANR TECSAN INEO V (650K€), MENRT (190K€ pour 2 thèses)	
onco, neuro, pneumo	ONCOFLUX	Metabolic flux MR imaging in tumors	2013	CREMILLIEUX (UMR 5536 (RMSB))	180 000 €	394K€= ITN Pi-Net (240K€), ANR Gd_Lung (154K€)	
Onco	PIAF	18F for PET-imaging angiogenesis	2011	FOUQUET (UMR5255 (ISM))	164 000 €	160,5K€= MENRT (97,5K€), INSERM (30K€), MESR (33K€)	IBA MOLECULAR (40K€)
onco	PRITOR	NeuroPeptide Receptors Imaging for TumOR Targeting	2013	HINDIE (UMR 5287 CNRS (INCIA))	30 000 €	2K€ Gallea (2K€)	
neuro	SCICOG&REACTIV	Imaging biomarker in MS	2011	DELOIRE (INSERM U1049)	130 000 €	60K€ ARSEP (60K€)	MERK SERONO (180K€), TEVA (150K€)
onco	SUPSIFLU	Supported Silyl Fluorination	2013	HERMANGE (UMR5255 (ISM))	30 000 €		
Neuro	TRAIL&TRACKS	Atlasing white matter tracts	2011	PETIT (UMR 5296 (GIN))	97 500 €	ISHARE	
Neuro	TRAILDNP	To improve in vivo DNP in mice at 0.2 T	2011	THIAUDIERE (UMR 5536 (RMSB))	142 500 €	185K€= ANR NITROMRI 2009 (170K€), ANR JC SonRadls2011 (15K€)	
Neuro	TRANSFEAR	Cerebral structure changes involved in pathological fear recovery	2012	BONNET (INSERM U862)	130 000 €	BRAIN (SANPSY)	

Annex 13

Scientific events in Bordeaux

INTERNATIONAL SPEAKERS

INTERNATIONAL SPEAKERS

DATE	SPEAKER	ORGANIZATION	CONFERENCE	SHANGHAI RANKING
April 2013	Dr Ernesto SANZ-ARIGITA	CITA Alzheimer, San Sebastian	Multidimensional biomarkers for early detection of neurodegeneration	-
July 2013	Professor Jeff W.M. BULTE	The Johns Hopkins University School of Medicine Baltimore	Seeing Cells with MRI	4th
July 2013	Professor Martin MEYER	Department of Psychology, Plasticity and Learning in the healthy aging brain, University of Zurich	Time, speech, and the right hemisphere	38th
November 2013	Professor Yasutaka FUSHIMI	Department of Diagnostic Imaging and Nuclear Medicine – Kyoto University	Cooperation between Kyoto University and Toshiba Medical	28th
September 2013	Dr Wafaa ZARAOUI	University of Marseille	Brain sodium MRI: implications for multiple sclerosis	151-200th
	Dr Franz SCHMITT	Siemens Research and Developement	Most recent development of High performance gradients and Ultra High Field	-
	Dr Lori BRIDAL	University Pierre et Marie Curie	Evaluating tumor vascular structure and its response to therapy with pre-clinical contrast-enhanced ultrasound	35th
	Pr Mike MODO	University of Pittsburgh	Image-guided injection and non-invasive monitoring of tissue engineering in stroke	10th
	Pr Constantin COUSSIOS	BUBBL, Oxford University	Real-time passive acoustic mapping of tissue ablation and drug delivery by ultrasound	17th
	Pr Sébastien LECOMMANDOUX	University of Bordeaux	Biomimetic polymersomes, a promising platform towards personalized nanomedicine	201-300th
January 2014	Pr Dennis PARKER	Utah Center for Advanced Imaging Research, Salt Lake City	MRI Guided Focused Ultrasound of the Breast	47th
May 2014	Pr Brian RUTT	Stanford School of Medicine	Neuroimaging at ultra high field	2nd
July 2014	Dr Christopher HAGEMEYER	Vascular Biotechnology Laboratory at Baker IDI in Melbourne	Enzyme-mediated Site-specific Bioconjugation for Molecular Imaging and Drug Delivery	-
September 2014	Pr David PERRIN	Department of Chemistry, University of British Columbia, Vancouver, CANADA	One-step Kit-like Radiofluorination of Peptides and other large molecules	37th

TRAIL

Translational Research and Advanced Imaging Laboratory

Conference

Mardi 23 Septembre 2014

Lieu : Amphithéâtre de l'IECB
2 rue Robert Escarpit, 33607 Pessac

11h00 - 12h00 :

One-step Kit-like Radiofluorination of Peptides and other large molecules

David Perrin, Professor at Department of Chemistry, University of British Columbia, Vancouver, CANADA

One-step Kit-like Radiofluorination of Peptides and other large molecules

Peptides and other large molecules exhibit high specificity and high affinity for biological targets. When labeled with an appropriate PET isotope, they may be used as imaging agents to validate preclinical targets and guide clinical diagnoses. Of all the PET isotopes, 18F-fluoride is often preferred due to its moderate half-life and facile production at Curie levels in hospital cyclotrons. Yet fluoride is generally unreactive in water while peptides and other molecules generally require water. Typically radiosyntheses involve several steps that can take up to 3 hours. We have sought to develop a user-friendly aqueous one-step labeling method that uses organoboronates as captors of aqueous fluoride in order to enable a kit-like one-step aqueous 18F-labeling approach that can be generalized to labeling large biomolecules and to prepare dual-mode fluorescent PET tracers. Progress in this development will be discussed.

David Perrin Research and Teaching Interests:

CATALYSIS AND MOLECULAR RECOGNITION APPLIED TO BIOLOGY RESEARCH THEME :

His research uses the tools of synthetic chemistry to address questions of molecular recognition and catalysis within a biologist setting, all the while maintaining medically relevant goals. He provides a comprehensive research program at the interface of chemistry and biology, and preliminary data for these projects have already appeared in peer reviewed journals.

Contacts

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TRAIL

Translational Research and Advanced Imaging Laboratory

Neuroimaging Conferences

Mercredi 21 Mai 2014

Lieu : Centre de Génomique Fonctionnelle Bordeaux (CGFB)
Campus Carreire

9h30 - 10h30

Neuroimaging at ultra high field

Brian RUTT, Professor of Radiology
Stanford School of Medicine – CA, USA

10h30 - 11h30

Diffusion MRI: From Diffusion to Brain connectomics

Aurobrata GHOSH, Post Doctoral Resarcher
Inria Sophia-Antipolis—Méditerranée – France

Neuroimaging at Ultra high Field

Brian RUTT

Ultra high field magnet (7 Tesla) for human exploration offers not only increased signal-to-noise ratio relative to 3T and lower field technologies, but also new contrast by virtue of modified relaxation times and dramatically increased susceptibility effects. Spectroscopic resolution and BOLD contrast are also improved at higher field. Nevertheless, to take advantage of this technology, several challenges of ultra high field need to be addressed such as increased B_0 and B_1 inhomogeneities and increased power deposited in subject. Solutions are being developed to mitigate these challenges and open the way to clinical applications especially in neurological disorders such as Alzheimer disease, multiple sclerosis, Parkinson disease or for planning deep brain stimulation procedures.

Brian Rutt joined the Stanford faculty as Professor of Radiology effective Jan. 1, 2009. Dr. Rutt, who is the author of more than 120 peer reviewed journal articles, is an internationally recognized expert in Magnetic Resonance Imaging (MRI). Prior to coming to Stanford, Dr. Rutt was Professor of Diagnostic Radiology and Nuclear Medicine and Medical Biophysics at the University of Western Ontario and the recipient of the Barnett-Ivey Heart and Stroke Foundation of Ontario Endowed.

Diffusion MRI: From Diffusion to Brain connectomics

Aurobrata GHOSH

Diffusion MRI (dMRI) is today a unique tool for inferring the microstructure of the CNS white-matter non-invasively and *in vivo*. It is the only method that allows an *in vivo* and non-invasive virtual dissection of the human brain to understand its connectivity (the human connectome) and to assess its integrity. Today, since a large population grows older and many pathologies are traced to disorders or degeneration of the cerebral white matter, dMRI is becoming invaluable for diagnosis and prognosis. In this talk I will cover the basic concepts of dMRI signal generation and a number of popularly used state-of-the-art models. This should give an idea of the possibilities that dMRI opens up and some directions for future research.

Dr. Ghosh has a PhD in Diffusion MRI from the Athena Project Team, Inria Sophia Antipolis -- Mediterranee & Universite de Nice. He has mainly worked on high order tensors and other functional bases (spherical harmonics, Hermite functions) for modelling and interpreting the diffusion MRI signal from HARDI acquisitions.

Contacts

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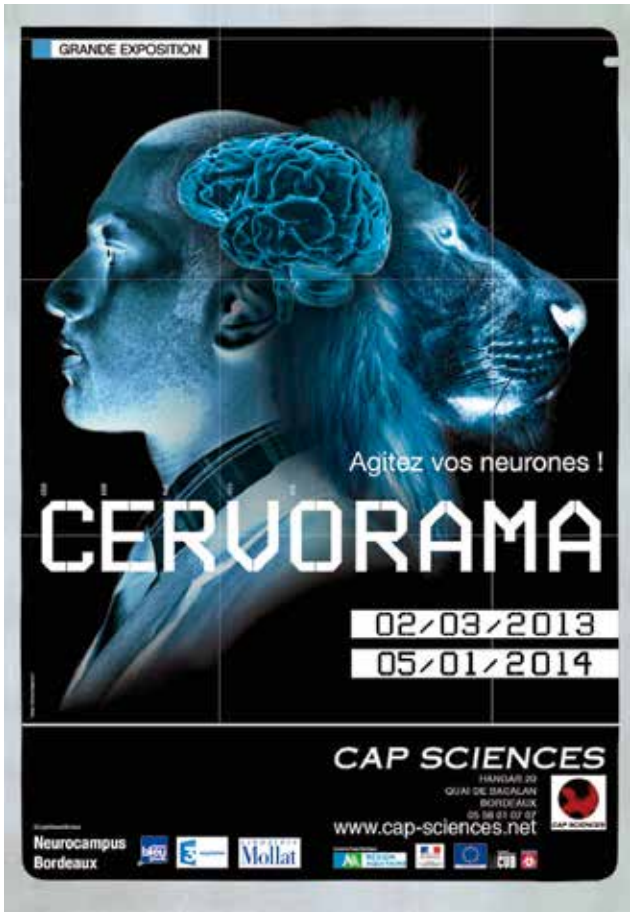
MENTORING ACTIONS IN 2011

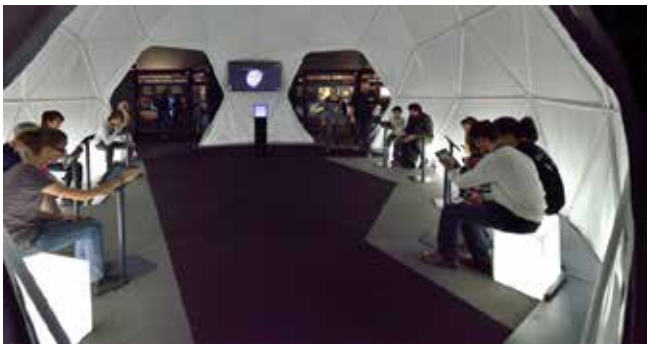
Mentoring Project	Project name	Project Leader	Team	Description	TRAIL grant	Number of participants	Partners
Thematic school	MODULOMAG: MRI contrast modulation	JM Franconi	UMR5536 (RMSB: Magnetic Resonance of Biological Systems Laboratory)	Installation of a thematic school on the topic: " contrast modulation as a MRI tool for the development of new diagnostic and therapeutic strategies».	23000€ (12000€ financed by TRAIL)	13	Mons University
Symposia	NGI: neuroglial interactions, from metabolism to activity	AK Bouzier-Sore		The goal of this symposia is to review some of the most exciting work that has been performed in this field of research, in the context of energy compartmentation, synaptic transmission and cognitive functions using various techniques such as 13C-NMR spectroscopy, immunochemistry, electrophysiology, cellular imaging, and to join top notch neuroscientits, spectroscopists, and clinicians working on neuron-glia interactions	7700 € (2400€ financed by TRAIL)	50	SFR neurosciences, SFR Tecsan, Aquitaine Region, Society of Neurosciences, BRAIN LabEx
International mobility	DIMI: New developments in myelin imaging with application to multiple sclerosis	T Tourdias	U862 (Magendie Institute)	We propose to develop, validate using direct histopathological correlation, and apply in a limited patient trial, a new quantitative, 3D whole-brain multi-component relaxometric MR imaging method for assessing myelin volume in multiple sclerosis (MS) patients (mcDESPOT) taking advantage of the higher magnetic fields, which are now available (3T and 7T). The potential impact of this development is major: if successful, it could represent the means to get past the present-day failure of MRI methods to accurately predict disease burden and ultimate outcome in MS patients with implication in the therapeutic strategy and clinical trials.	15000€ (5000€ financed by TRAIL)	1	Fundation of Bordeaux University

DISSEMINATION ACTIONS

CERVORAMA (http://www.cap-sciences.net/pageseditos,441,left_BC9263C5.html)

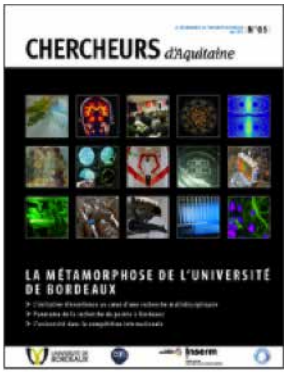
CERVORAMA was an exhibition organized by Cap Sciences Museum in Bordeaux showing how unique the brain is. Exhibition had 5 main themes: 1) comparing brain of animals and humans, 2) understanding cognitive functions, memory, plasticity 3) zooming into the brain using a 3D interactive presentation of its anatomy, 4) playing tricks to the brain, 5) discovering the cybernetic world.





Chercheurs d'Aquitaine (http://www.chercheursdaquitaine.com/index.php?lang=fr)

"Chercheurs d'Aquitaine" is a magazine about research and researchers from Aquitaine; it is distributed in all major public libraries in Aquitaine. The number 5 of this magazine – published in 2013 – was fully dedicated to the presentation of Idex Bordeaux, the LabEx and their directors.



Portrait

Vincent DOUSSET
Une certaine image de la recherche

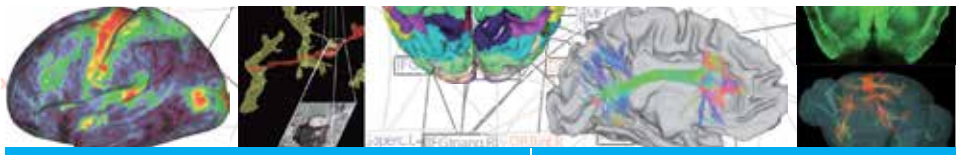
C'est un passionné de littérature : Marguerite Yourcenar, Primo Levi, Cioran, Fernando Pessoa, Kawabata, Hemingway, et bien d'autres. L'homme préhistorique est son modèle « pour ce que fut sa bataille à survivre. » Il aime donc la vie, l'Homo sapiens et la médecine. La médecine qu'il a choisie « par curiosité et par crainte de méconnaître les mécanismes de la vie et des maladies. » Mais il a pourtant longtemps hésité avec Sciences Po et le journalisme. Le professeur Vincent Dousset dirige le service de neuroradiologie diagnostique et thérapeutique au CHU de Bordeaux et le labex Trail (Translational Research and Advanced Imaging Laboratory). C'est au cours de son internat en radiologie qu'il rencontre l'imagerie par résonance magnétique, encore balbutiante, dans le service du professeur Jean-Marc Caillé. « Il occupait le bureau que j'occupe aujourd'hui, dit-il avec nostalgie. C'est lui qui m'a initié à la recherche clinique alors qu'à l'époque c'était presque mal vu de faire de la recherche à l'hôpital. » Le jeune radiologue part alors aux états-Unis comme research fellow à l'university of Pennsylvania, dans le service du professeur Robert I. Grossman, neuro-imageur et spécialiste mondial de neuro-imagerie. Cela confirme son attirance pour l'imagerie médicale et surtout pour la recherche qui canalise sa soif de curiosité. Mais pour progresser dans sa science comme dans la vie, le médecin a sa philosophie : « Il n'y a pas plus faux que la vérité et il faut surtout s'éloigner des détenteurs de vérité. J'aime l'incertitude. N'adhérer à rien de façon irréversible. Se laisser flotter. Cela suppose de maintenir la porte ouverte à l'autre. » La recherche en imagerie médicale ouvre justement la porte aux autres… Physiciens, biologistes, mathématiciens, informaticiens. C'est une recherche translationnelle qui s'exprime à travers les progrès fulgurants des scanners, IRM et autres technologies, rendant jour après jour le corps humain encore plus transparent. Durant les dix dernières années, Vincent Dousset a réussi à fédérer les forces de la bio-imagerie fonctionnelle bordelaise pour créer l'institut de Bio-Imagerie en sciences médicales et emmener cet institut vers Trail. Le programme des investissements d'avenir va permettre aussi de faire entrer Bordeaux dans le club très fermé des six grandes plateformes nationales de bio-imagerie du vivant. Il ouvre également l'université à la compétition internationale dans le domaine. C'est d'ailleurs le développement de la notoriété internationale de l'université Bordeaux Segalen qui mobilise aujourd'hui une bonne partie de l'énergie de Vincent Dousset depuis qu'il s'est vu confier le poste de vice-président aux relations extérieures. « C'est un honneur de travailler auprès de la direction de Bordeaux Segalen, » dit-il, mais cela, regrette-t-il, l'amène cependant trop souvent bien loin des chemins de randonnée du Balaïtous ou de l'Ossau, là où il puise régulièrement l'énergie de sa qualité première : l'humanisme.

Didier Dubrana

Annex 14

CONNECTOMICS : THE WIRING DIAGRAM OF THE HUMAN BRAIN, SEPTEMBER 2014

http://connectomics2014.u-bordeaux.fr/



CONNECTOMICS 2014
THE WIRING DIAGRAM OF THE HUMAN BRAIN

1st International Summer School
September 22-26, 2014 - Bordeaux

A new discipline of modern neuroscience, the connectomic, examines the organization and functioning of the brain across all its anatomical and functional connections, namely the connectome. The understanding and optimal use of these methods require a multidisciplinary training for neuroscience researchers. This is the challenge of "CONNECTOMICS 2014", the first international summer school offering to the scientific community a state of the art of the advanced approaches currently used in determining the wiring diagram of the human brain, to deepen or to acquire new knowledge about a domain still not taught and booming: the human brain connectome.

Scientific committee

Katrin Amunts, Institute of Neurosci. and Medicine, Jülich, Germany; **Bernard Mazoyer,** Groupe d'Imagerie Neurofonctionnelle UMR5296, Bordeaux, France; **Christophe Mulle**, Interdisciplinary Institute of Neuroscience, UMR5297, Bordeaux, France; **Tomáš Paus**, Rotman Research Institute, Baycrest Centre, Toronto, Canada; **Laurent PETIT**, Groupe d'Imagerie Neurofonctionnelle UMR5296, Bordeaux, France.

Audience

The school will welcome 50 researchers, engineers, post-docs and end-term PhD interested in the topic of the connectome.

Information and Registration

http://connectomics2014.u-bordeaux.fr
deadline : 31st of July, 2014

Registration fees cover the courses, accommodation, coffee and lunch breaks.
500 € for researchers and engineers
300 € for post-docs and PhD students

Note that CONNECTOMICS 2014 is a Thematic School of the CNRS allowing no fees for personal employed by the CNRS.

Please note that the registration is mandatory to validate your application. Once your application is completed and has been evaluated, the organizing committee will let you know the final decision. If you are selected, registration process should be finalized through the payment of fee.

Program

September, Monday 22nd PM

Opening lecture
Connectome, connectomics: Origins by Olaf SPORNS

Microscopic structural connectome
- Neural circuit analysis with Brainbow by K. MATHO
- Activity-dependent labeling of memory engrams by S. RAMIREZ
- Advanced optical techniques for brain-wide imaging of neuronal activity by R. PREVEDEL

September, Tuesday 23rd

Microscopic structural connectome
- The secrets of neuronal circuits with recombinant rabies virus by A. FRICK
- Mapping synaptic function and connectivity in cortical cells by T. MARGRIE
- Optogenetic interrogation of valence circuits by A. BEYELER

Macroscopic structural connectome
- Connectomic approaches before connectome by M. THIEBAUT de SCHOTTEN
- The do's and don'ts of diffusion MRI by A. LEEMANS
- Advances in diffusion MRI acquisition and processing by S. SOTIROPOULOS
- Tractography with tractometer by G. GIRARD

September, Wednesday 24th

Macroscopic structural connectome
- dMRI in cortical gray matter and its validation with histology by A ROEBROECK
- Tractography against dissection by S. SARUBBO
- Insight into the development and maturation of the brain by T. PAUS

White matter as transport system
- White matter as a transport system by T. PAUS
- Titled coming soon by R. PAUTLER
- Titled coming soon by G. MORFINI

Introduction to Allen Institute resources
- Advancing neuroscience with the Allen Brain Atlas by T. GILBERT

September, Thursday 25th

Intrinsic connectivity
- Studying large-scale brain networks: Electrical stimulation & neural-event-triggered fMRI by N. LOGOTHETIS
- Temporal dynamics of the resting-state signal by C. CHANG
- Graph analysis of the connectome by S. ACHARD
- Extrinsic/intrinsic modular organization of the connectome by G. DOUCET
- Modular structure of fMRI networks in resting-state by D. MEUNIER
- Relation between r-fMRI and t-fMRI connectomes by F. HOFFSTAEDTER
- Cerebral Cortex Connectomics by M. HELMSTAEDTER

September, Friday 26th AM

Databasing
- The Brain CONNECT project by Y. ASSAF
- The BIL&GIN project : Investigating asymmetries by B. MAZOYER
- Genetics of the Connectome and the ENIGMA Project by P. THOMPSON

INVESTISSEMENTS D'AVENIR · EXCELLENCE universitaire de Bordeaux INITIATIVE · EXCELLENCE LABORATORY TRAIL · université de BORDEAUX · cnrs

All 40 participants (clinicians, engineers, researchers, post-doctoral and doctoral fellows) were very satisfied by the summerschool. Half of them answered a satisfaction survey and gave a global rate of "A" to the summerschool (courses, speakers, ambience, housing,...) and wish to participate to next edition.

Annex 15

New buildings

a) IBIO

b) PTIB

Annex 16

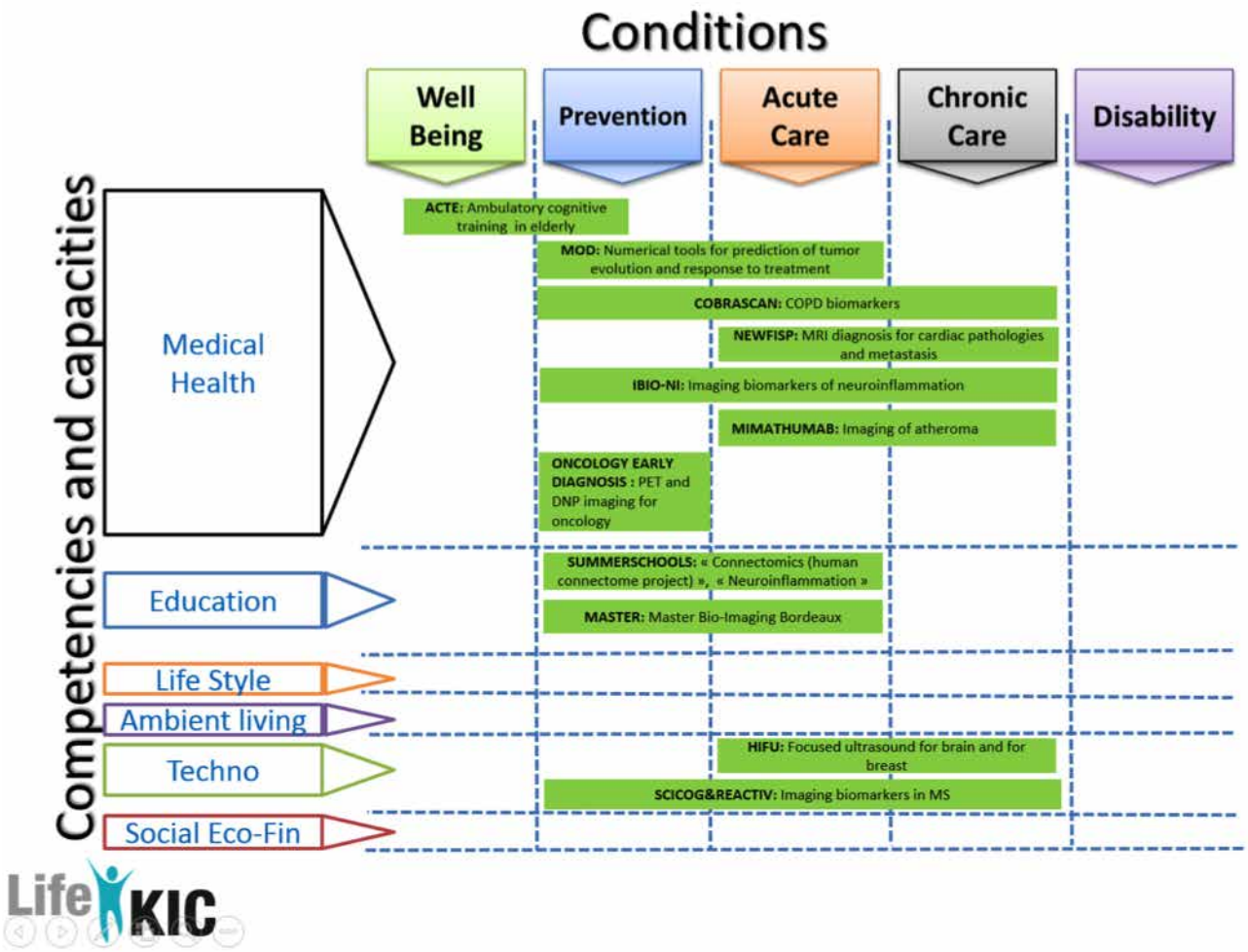
H2020 LifeKic Consortium

http://ec.europa.eu/programmes/horizon2020/en/h2020-section/health-demographic-change-and-wellbeing

Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative aimed at securing Europe's global competitiveness. It is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020), without counting the private investment that this money will attract. It promises to deliver more breakthroughs, discoveries and world-firsts by taking great ideas from lab to market. The programme has 7 main sections, among them the societal and "health, demographic change and wellbeing" challenges.

Responding to this challenge, research and innovation (R&I) under Horizon 2020 is an investment in better health for all. It aims to keep older people active and independent for longer and supports the development of new, safer and more effective interventions. R&I under Horizon 2020 also contributes to the sustainability of health and care systems.

University of Bordeaux participates with the "Région Aquitaine" to the LifeKic european consortium and will so participate to H2020 health calls organized by the European Institute of Innovation and Technology (EIT, http://eit.europa.eu/). Several health research projects from the University of Bordeaux have been selected to join the LifeKic research portfolio. For TRAIL, 11 projects have been chosen, because of their relevance with LifeKic strategy and H2020 health challenges:



Annex 17

Project of International Summerschool "Imaging of Neuroinflammation"

A 8 days program focused on the specificities of imaging neuroinflammatory disorders presented by renowned international speakers:

- A unique approach: from cellular imaging, to pre-clinical imaging on animal models, to human imaging on patients. Courses and lectures will be mixed with practical sessions on up-to-date imaging equipments
- A great location: the city of Bordeaux is on the world heritage list and the area has the largest and oldest fine wine vineyard in the world

Presentation

Imaging tools are essential to better understand the multiple features of neuroinflammation, to diagnose, and they have strong impact to monitor the treatment of patients such as those affected by multiple sclerosis. A Large panel of imaging techniques is available at every spatial scales. They require specific skills and their application to neuroinflammation have several specificities. The University of Bordeaux gathers a unique scientific environment, technics and facilities, with world leader experts in microscopic imaging tools (LabEx BRAIN, D. Choquet) as well as in in vivo imaging in animals and humans (LabEx TRAIL, V. Dousset).

In this context, we plan to organize "2015 Summer School of Imaging in Neuroinflammation" in Bordeaux as part of the "International School of Neuroscience".

The main part of the course is practical: participants will learn how to set up an experiment, train on several scans and analyze images. The theoretical part will consist on courses, discussions and paper analysis presented by local and international experts.

The course will start from the single particle tracking of membrane molecules involved in inflammation. The photonic techniques to explore immune cell invasion and its consequences on tissue in vivo will be addressed. We will discuss the animal models of inflammation suitable for imaging and the in vivo imaging techniques used in animals. This course will provide a large view on the technical approach, practical issues and post treatment methods for large scale cohort analysis.

Benefits

The theme is major: inflammation is encountered in many neurological disorders and imaging of neuro inflammation is crucial for several applications.

The approach is unique: the summerschool will cover a wide range of spatial scale from cellular imaging, to pre-clinical imaging on animal models, to human imaging on patients. Half of the course will be theoretical and half practical, giving access to up-to-date imaging equipments

Renowned international speakers

Attractive area: the city of Bordeaux is on the world heritage list and Bordeaux area has the largest and oldest fine wine vineyard in the world.

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More information

trail.labex.u-bordeaux.fr/en/

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Décembre 2014 - réalisation : direction de la communication, université de Bordeaux