

Imagerie moléculaire et fonctionnelle : de la physiologie à la thérapie

Rapport Hcéres

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agence d'évaluation de la recherche
et de l'enseignement supérieur

Section des Unités de recherche

AERES report on the research unit

Imagerie Moléculaire et Fonctionnelle :

de la physiologie à la thérapie (IMF)

UMR 5231

From the

Université Bordeaux 2 Victor Segalen

CNRS

May 2010



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Imagerie Moléculaire et Fonctionnelle : de la
physiologie à la thérapie (IMF) UMR 5231
From the
Université Bordeaux 2 Victor Segalen
CNRS

Le Président
de l'AERES

Jean-François Dhainaut

Section des unités
de recherche

Le Directeur

Pierre Glorieux

May 2010



Research Unit

Name of the research unit: Imagerie Moléculaire et Fonctionnelle : de la physiologie à la thérapie (IMF)

Requested label: UMR CNRS

N° in the case of renewal: 5231

Name of the director: M. Chrit MOONEN

Members of the review committee

Chairman Committee

Mr Robert MULLER, Univ. Mons, Belgique

Other committee members

Mr Hervé SAINT-JALMES, Université Rennes 1

Mr Ponnada NARAYANA, Univ. Texas, Houston, Etats-Unis

Mr Jean-Philippe RANJEVA, Université de la Méditerranée (Aix-Marseille 2)

Mr Pascal MERLET, CEA Orsay

Mrs Graciela PAVON-DJAVID, Université Paris 13

Committee members suggested by CNU, CoNRS, CSS INSERM, CSS INRA, INRIA, IRD...

Mr Maxime GUYE, CoNRS representative

Mr Jean-Marc CONSTANS, CNU representtaive

Observers

AERES scientific advisor:

Mr Christian BARILLOT,

University representative

Mr Alain BLANCHARD, Vice-Président du Conseil Scientifique, université Bordeaux 2

Research organisation representative

Mrs Evelyne Jouvin Marche, CNRS



Report

1 • Introduction

- Date and execution of the visit

The meeting started at 14.00 hrs on the 12th of November with the presentation by the director and his team members about the scientific objectives of UMR 5231, its structure and organization, and some of the projects that are currently in progress. The presentations were followed by series of questions and answers and discussion. Following these presentations, the Evaluation Committee visited the NMR facilities and listened to the presentations by some of the team members. On the afternoon of the 13th, the Evaluation Committee, in a closed door session, discussed their impressions of the center and identified strengths and weaknesses of this research team. This report reflects these deliberations.

- History and geographical localization of the research unit, and brief presentation of its field and scientific activities

The “Laboratory for Molecular and Functional Imaging: From Physiology to Therapy” was created in 2007 under, first as a Technological Research Team of CNRS/University Bordeaux 2 affiliated with UMR5543. In 2007, the Laboratory became an independent Mixed Research Unit (UMR5231) of CNRS/University Bordeaux 2. Since its creation, the research activities of this multi-disciplinary team (physicists, electronic engineers, informatics specialists, biologists, radiologists, surgeons) have been in the field of MR guided Focused Ultrasound (MRgFUS), multi-modality molecular imaging, and physiological and functional imaging. During the past period, the laboratory was organized in two teams. The team 1 “Image Guided Therapies and Molecular Imaging” is a world leader in the emerging technology of MRgFUS with 8 patents and many excellent scientific papers. The team is strongly involved in European projects, and European and International research policy. The translation to the clinic is facilitated by collaboration with Philips Healthcare, the Bordeaux Academic Hospital (CHU) and a specialized anticancer center (Centre Bergonié) where prototype systems have been installed for MRgFUS of uterine fibroids and cancer. The core objective of team 2 “Human cognitive neurosciences and neuro-imaging” was to examine the relation between anatomic-functional deficits to cognitive behavioral impairment in CNS disorders, in age-related neurodegenerative diseases and in specific psychiatric conditions. Team 2 has implemented a multimodal imaging approach coupling morphological and functional MR techniques and developed molecular imaging, using Single Photon Emission Computerized Tomography (SPECT) and Positron Emission Tomography (PET). In parallel, they developed and validated ambulatory monitoring techniques for the assessments of symptoms in natural contexts, the Experience Sampling Method (ESM), as well as having applied advanced neuropsychological assessment techniques in a number of projects.

The renewal of UMR5231 with a single team (former team 1) is in the domain of « Health Technologies », one of the five principal research fields of the University Bordeaux 2. With respect to the National Research Institutes, a division of 70% INST2I and 30% INSB is envisaged. The national platform “Magnetic Resonance Spectroscopy and Imaging (www.pfsi.u-bordeaux2.fr), run jointly with UMR5536, has again been recognized officially by GIS-IBISA in 2009, together with a substantial investment in personnel and new equipment. As part of this platform, UMR5231 manages two whole body state-of-the-art MR systems (1.5T, 3T), as well as optical imagers (primarily for mice). The laboratory plans to establish scientific collaboration with UMR5536 in the coming years with the final merger between these units in 2015. UMR5231 is at the center to create the Institute of Bio-Imaging, one of the key projects of the University Bordeaux 2, and financed by the State-Region contract (CPER) 2007-2013 with 10M€. Its principal geographical localization is in a temporary building of the Academic Hospital, next to the neurosurgery department.

- Management team

Current : Moonen (Director) ; Allard (Associate Director); Brosed (Financial Manager); Bureau (Senior Member)

Proposed: Moonen (Director); Brosed (Financial Manager); Bureau (Senior Member)



- Staff Members (on the basis of the application file submitted to the AERES)

	Past	Future
N1: Number of researchers with teaching duties (Form 2.1 of the application file)	11	4
N2: Number of full time researchers from research organizations (Form 2.3 of the application file)	6	4
N3: Number of other researchers (Form 2.2 and 2.4 of the application file)	5	7
N4: Number engineers, technicians and administrative staff with a tenured position (Form 2.5 of the application file)	4	3
N5: Number engineers, technicians and administrative staff without a tenured position (Form 2.6 of the application file)	6	3
N6: Number of Ph.D. students (Form 2.7 of the application file)	9	7
N7: Number of staff members with a HDR or a similar grade	12	6

2 • Overall appreciation on the research unit

- Summary

This research unit is a world leader in the emerging technology of MR guided Focused Ultrasound. The expertise of this group ranging from basic research to clinical applications is internationally recognized. They have excellent publications in the top international journals in the field. The international importance of this project is also illustrated by 3 participations in the Europeans projects and the presidency of two international scientific societies. This team is very well funded through grants from foundations, Région Aquitaine, ANR as well as European programs. The industrial relationships are stable and fruitful: 4 patents were granted during the last contract. The small number of permanent staff and engineers is a concern for this group that is involved in complex topics requiring significant technical skills. To partly solve this lack of human resources, the development of common research work with the UMR5536 should help and this merger should be organized as soon as possible. Finally, this group will play a leading role in the "Institut de l'Imagerie de l'Homme et du Vivant" that is being built by the Bordeaux 2 University.

- Strengths and opportunities

The team 1 "Image Guided Therapies and Molecular Imaging" is a world leader in the emerging technology of MR guided Focused Ultrasound. The expertise of this group is outstanding, with the research project well focused with a high degree of coherence. Moreover, the translation of the research developed by this group to clinic for patient applications is already effective and expanding. Since 2006, the group has participated in 9 projects financed by foundations (Ligue Nationale contre le Cancer, Innabiosanté) and Région Aquitaine, 3 projects financed by the ANR (National Research Agency) and 3 large European projects. A long term collaboration contract has also been established with the Philips Medical Systems (Best, Nederland) to implement MRgFUS on clinical MR scanners. In 2009, about 80% of the financing for the research projects (excluding permanent salaries and housing) is provided by grants and contracts. The group is strongly involved in European projects, and European and international research policy. The national and international visibility of this group in medical imaging and image-guided therapies can be assessed by about one hundred invited presentations in the last period. This group will certainly play a leading role in the "Institut de l'Imagerie de l'Homme et du Vivant" that is being established by the Victor Segalen Bordeaux 2 University. UMR5231 group is coordinating the financing from the CPER of this institute.



- Weaknesses and threats

The small number of permanents and engineers is a concern for this group involved in complex topics requiring a variety of technical skills. The supervision of the PhD students is not sufficiently shared among the permanent members of the group.

- Recommendations to the head of the research unit

The group is already very efficient and productive and its research topics are very innovative. For the next project, this group will work without team 2 and the small number of permanent researchers and engineers was underlined previously. A partial solution to the shortage of human resources might be the development of a common research project, for example, molecular imaging with the UMR5536. This could occur much sooner than the planned merger in 2015!

- Production results

A1: Number of lab members among permanent researchers with or without teaching duties who are active in research (recorded in N1 and N2)	17
A2: Number of lab members among permanent researchers with or without teaching duties who are active in research (recorded in N3, N4 and N5)	6
A3: Ratio of members who are active in research among staff members [A1/(N1+N2)]	1
A4: Number of HDR granted during the past 4 years	2
A5: Number of PhD granted during the past 4 years	7

3 • Specific comments

- Appreciation on the results

As already mentioned, the group has been at the heart of recent developments of MRI guided Focused Ultrasound. This innovative work was done with strong industrial partnerships (Philips Medical Systems, Imasonic) as well as cooperation with the University Hospital of Bordeaux and the AntiCancer Center Bergonié.

The productivity achieved during the last 4 years has been very even. The quality of the publications is excellent with highly satisfactory statistics (1.2 to 1.5 paper/member per year): 51 articles were published by team 1 and 95 by team 2 in the top international journals in their discipline (PNAS, Radiology, Neuroimage, Magnetic Resonance in Medicine). Seven students graduated with PhD during the last contract.

This group established numerous high quality partnerships. This team is involved in three European contracts (DiMI, MediTrans, SonoDrugs). The link with Philips Medical Systems is extremely important for this group and is based on a long term and stable basis (12 years). The partnership with clinicians is also strong and allows this group to translate the research results to clinical practice for improved healthcare.



- **Appreciation on the impact, the attractiveness of the research unit and of the quality of its links with international, national and local partners**

This laboratory presents outstanding projects that are targeted and organized with technologies which enable it to be a world leader in the field. The international implication is illustrated by 3 participations (Workpackage leader) in European projects and presidency of two large international scientific societies: "International Society of Magnetic Resonance in Medicine" in 2005 and "Society for Molecular Imaging" in 2009. The undeniable recognition of the director of the laboratory at the national and the international levels (62 invited conferences), allows a very effective network of collaborations as well academic as industrial.

The high visibility of the laboratory helped the recruitment of young researchers : 1CR2 CNRS researcher, 5 contractual researchers and 2 industrial researchers.

The recognition of the laboratory undoubtedly played a critical role in obtaining important grants which ensured its financial viability. The laboratory is coordinator of major subsidies (Area, Feder, ANR, InNaBioSanté Foundation, League National Against Cancer). The laboratory is in charge (with UMR5536) of the platform IBiSA (Imagery and Spectroscopy by Magnetic resonance).

The laboratory as an international visibility :2 foreign permanent members, 1 foreign postdoc, 2 foreign PhD students, several Erasmus students, exchanges in Europe and in the United States : Stanford University and NIH (Washington DC).

The research group was awarded 4 patents on the development of MRI guided Focused Ultrasound. Philips Medical Systems announced the development of a product line based on this work and the ablation technique is already used in clinic.

- **Appreciation on the strategy, management and life of the research unit**

The structure of this relatively small group seems adequate. The supervision of PhD students is also very efficient. All the PhD students are encouraged to attend national and international meetings. Seminars are regularly organized in the laboratory allowing the communication between the members. However, the committee recommends the organization of common seminars with the UMR 5536.

The contribution of this group to teaching is modest. This group will certainly play a leading role in structuring the research at the local level being involved in the "Institut de l'Imagerie de l'Homme et du Vivant" that is being built by the Victor Segalen Bordeaux 2 University. Again, the committee urges this group to establish strong collaboration with the UMR 5536 before the merger planned for 2015.

- **Appreciation on the project**

The project presented by the group is in line with the strong expertise developed during the last 4 years. For the next period, the focus of the group will be on image guided drug delivery and image guided cell therapies using both MRI and Ultrasounds while pursuing developments on ablation. The challenge will certainly be to perform a real-time monitoring of drug/gene delivery by Ultrasound/MRI as well as with a newly added imaging modality using intravital optical microscopy.

The allocation of ressources in this group seems adequate. This group is also coordinating the funds from the CPER for the "Institut de l'Imagerie de l'Homme et du Vivant" that is being built by the Victor Segalen Bordeaux 2 University.

The project presented by the group will benefit from the expertise acquired on MRI guided Focused Ultrasound. This technique originally developed for ablation will be used, in the next contract, to guide drug delivery and cell therapies. This project is highly innovative and appears very promising.



Note de l'unité	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
A+	A+	A+	B	A+



Monsieur Pierre GLORIEUX
Directeur de la section Unités de recherche
AERES

Bordeaux, le 16 février 2010

Monsieur le Directeur,

Je vous informe que Monsieur Chrit MOONEN, Directeur de l'unité « Imagerie moléculaire et fonctionnelle : de la Physiologie à la Thérapie » n'a aucune remarque particulière à formuler concernant le rapport du Comité de visite de l'AERES.

Je vous prie de croire, Monsieur le Directeur, à l'assurance de mes sincères salutations.

Le Vice-Président du Conseil Scientifique,

Alain BLANCHARD