

EVALUATION REPORT ON THE UNIT:

IMoST - Imagerie moléculaire et
stratégies théranostiques

UNDER THE SUPERVISION OF INSTITUTIONS AND RESEARCH BODIES:

Université Clermont Auvergne
Institut national de la santé et de la
recherche médicale

EVALUATION CAMPAIGN 2025-2026
GROUP A



On behalf of the committee of experts:

Hervé Boutin, Chairperson of the committee

For Hcéres:

Coralie Chevallier, President

In accordance with articles R. 114-15 and R. 114-10 8° of the Research Code, evaluation reports drawn up by the committees of experts are signed by the chairpersons of these committees and countersigned by the president of Hcéres.

To facilitate the reading of the document, the terms used in this report to designate functions, occupations or responsibilities (expert, researcher, teacher researcher, professor, lecturer, engineer, technician, director, doctoral student, etc.) are generic and gender neutral.

This report is the outcome of an evaluation by a committee of experts, the composition of which is specified below. The assessments it contains are an expression of the independent and collegial deliberation of the committee. The data within it are the certified accurate data extracted from the application forms submitted by the supervising bodies on behalf of the unit.

This version of the report is public in accordance with the provisions of article R. 114-23 of the Research Code. Sections of the report considered confidential, and responses to points of attention from supervisors are not included in it.

MEMBERS OF THE COMMITTEE OF EXPERTS

Chair :

- Mr Hervé Boutin, DR, Institut national de la santé et de la recherche médicale, Tours

Experts :

- Mr Ahcene Boumendjel, PR, Université Grenoble Alpes, La Tronche, représentant du CNU 86
- Mr David Brasse, DR, Centre national de la recherche scientifique, Strasbourg
- Mr François Paris, DR, Institut national de la santé et de la recherche médicale, Nantes, représentant Inserm CSS7
- Mr Jérôme Redoute, IR, Université Claude Bernard Lyon-I, Bron, (supporting personnel)

HCERES SCIENTIFIC ADVISOR

Mme Marlène Wiart, DR, Centre national de la recherche scientifique, Lyon

REPRESENTATIVES OF THE UNIT'S SUPERVISING INSTITUTIONS AND BODIES

Mme Vanessa Prévot, VP Recherche UCA
Mme Marie-Josèphe Leroy-Zamia, directrice adjointe IT Technologies pour la Santé, Inserm

UNIT CHARACTERISATION

- Name: Imagerie moléculaire et stratégies théranostiques
- Acronym: IMoST
- Label and number: UMR 1240 Inserm
- Number of teams: two
- Composition of the executive team: Mme Elisabeth Miot-Noirault (Director) et Mme Frédérique Penault-Llorca (Deputy Director)

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement
SVE7 Prevention, Diagnosis and Treatment of Human Diseases
ST4 Chemistry

THEMES OF THE UNIT

The research themes of IMoST are **i)** the identification of biomarkers **ii)** and the development of radiopharmaceuticals and therapies using these biomarkers applied mostly to oncology and to joint diseases (arthritis).

Team 1 specialises in the identification of biomarkers and targets and leads from chemistry for the development of radiotracers and therapies to the validation of those in preclinical models. Team 2 takes on the translation of the tools developed by Team 1 into clinical applications.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

IMoST is located in Clermont-Ferrand and hosted in the University Clermont Auvergne. The unit was born in 2017 from the merge of 3 research labs:

1. UMR 990 Inserm, Molecular Imaging and Vectorized Therapies (IMTV);
2. EA 4677 ERTICA, Auvergne University, Research Team on Personalized Therapies in Cancer;
3. Members of the EA 7286 Create, Auvergne University, Cancer Resistance Exploring and Targeting.

The UMR1240 benefits from spacious offices and labs spaces representing totalling a little over 2000 m² located on 3 sites, include a specific building which is Inserm property, but all within walking distances from each other.

UNIT RESEARCH ENVIRONMENT

The unit encompasses five platforms that cover all the needs of the unit in terms of research capabilities (organic and analytical chemistry, radiochemistry, biology and biomarker discovery, preclinical in vivo platform, a GMP production suite). These platforms are well equipped to perform its research in nuclear imaging applied to oncology and arthritis, from cold organic chemistry, radiochemistry suite to in vivo preclinical imaging (PET- & SPECT-CT, optical, gamma-camera) and beyond with all the necessary equipment to perform biopsy analysis.

UNIT WORKFORCE: IN PHYSICAL PEOPLE AS OF 31/12/2024

Staff categories	People
University professors and equivalents [Fr: Professeurs et assimilés]	17
Lecturers and equivalents [Fr: Maitres de conférences et assimilés]	16
Research Director and equivalents [Fr: Directeurs de recherche et assimilés]	0
Research Officer and equivalents [Fr: Chargés de recherche et assimilés]	4
Support personnel for research (e.g. engineers) [Fr: Personnels d'appui à la recherche]	24
Hospital practitioner [Fr: Praticien hospitalier]	17
Subtotal permanent active personnel	78
Lecturers-researchers and non-permanent researchers and equivalents [Fr: Enseignants-chercheurs et chercheurs non permanents et assimilés]	2
Non-permanent support staff [Fr: Personnels d'appui non permanents]	6
Postdoctoral Researchers [Fr: Post-doctorants]	2
Doctoral students (PhD candidates) [Fr: Doctorants]	19
Subtotal non-permanent personnel	29
Total	107

BREAKDOWN OF THE UNIT'S PERMANENT STAFF BY EMPLOYER: IN PHYSICAL PEOPLE AS OF 31/12/2024. NON-SUPERVISING EMPLOYERS ARE GROUPED ON THE HEADING 'OTHERS'.

Employer	Teacher-Researcher (Fr: Enseignant-chercheur - EC)	Researcher (Fr: Chercheur - C)	Administrative and Research Staff (Fr: Personnel d'appui à la recherche - PAR)
UCA	33	0	10
Inserm	0	0	4
Others	17	4	10
Total	50	4	24

GLOBAL ASSESSMENT

The general opinion of the HCERES evaluation committee was that the activity report was very long and dense and would have greatly benefited from a far more synthetic approach in which key findings, publications and actions taken to address the comments received during the last evaluation would have been easier to spot and identify.

Overall, IMoST is a well-structured and organised unit. On the activity of the unit per se, their achievements over the past 5 years are impressive both in terms of quality and quantity of the scientific productions (>570 publications and conference proceedings). This impressive production reflects the innovative character of the science done at IMoST as well as the amount of funding obtained by researchers of both teams. Regarding

funding, the amount obtained are very heterogeneous but smaller funds highlight the capacity of the unit to lead pilot projects to obtain preliminary data in order to secure larger grants.

Regarding the weaknesses highlighted in the last evaluation, there are clear attempts by the IMoST teams to deal with them. One of them was the potential risk of dispersion within each team and some overlap between teams' activities. While this seems to be still a potential risk that must be controlled, it is not a threat to the activity of IMoST and even more, some of it is necessary to ensure that the more fundamental research of Team 1 translates into clinical applications in Team 2. On that aspect, the translational research performed by IMoST is certainly a highlight with several ongoing clinical studies/trials.

Another identified weakness was the lack of national and international recognition, and while there has been an effort on that front too, the committee believes that this is still an area where there is room for improvement. While several IMoST researchers are members of scientific societies and of various working groups in those societies, participation as elected board members is low and is certainly a possible way to improve this. A unit with such publication records undoubtedly deserves to be more visible internationally. Most collaborations and networks are at national level and should be extended to European/International level. While there were applications to EU funding, these were unsuccessful so far. The committee can only encourage IMoST staff to pursue in this direction. Increasing international visibility would, for example, increase the chance of participating or coordinating Marie-Curie Doctoral Network and EU Horizon grant applications.

Another recommendation was to increase recruitment of high-profile researchers. The committee noticed in the current report that the number of Inserm staff in each team was rather low and clearly outweighed by university staff (which are not 100% FTE researchers). However, while it would be desirable to increase this number, the committee is fully aware of the difficulty of doing so due to the competitiveness of the Inserm recruitment modalities. To conclude the global assessment is extremely favourable with some points that can still be improved, some should be fairly easy to achieve such as increasing international recognition and others, such as increasing Inserm recruitment, will be more difficult as they in part are out of the hands of IMoST board.

DETAILS OF THE EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

In order to enhance the scientific momentum and increase the impact of the research conducted within the unit, several priority areas for improvement had been identified during the last evaluation. The recommendations issued during the last evaluation concerned the overall scientific strategy, international positioning, internal organization, and the dissemination and valorisation of results.

While the measures implemented since this evaluation addressed the majority of these recommendations, certain aspects merit further reinforcement. In particular, from the report, we understood that efforts were made to increase international recognition and visibility, but that those fell short. Indeed, recognition is mainly at the national level through collaborations in France, and we felt that there is still room for improvements regarding this important point. International recognition could notably be achieved through participation to the board of scientific societies and more involvement in EU organisations which would in return increase participation in European projects, eventually leading to coordination of projects on topics that are strategic for the unit.

Regarding the publications, the unit is displaying a very strong list of publications with a good number of high-impact publications in its fields of expertise. As impact factor is no longer used as a criterion for evaluation, it would also be preferable for the next activity report to report the number of citations per year extracted from WebOfScience. A list of the top 10 papers with first/last/corresponding authors from the unit as well as highlighting the joint team1-2 papers would have been most useful in the report, this was later provided in the answers to the committee's questions.

B - EVALUATION AREAS

EVALUATION AREA 1: THE UNIT'S SCIENTIFIC OBJECTIVES, ORGANIZATION AND RESOURCES

Assessment of the unit's scientific objectives, organization and resources

The organisation, resources and objectives of the unit are in good adequation with its historic activity, fields of expertise and projects. However, the number of full time Inserm researchers remains low even if we are aware of the difficulties recruiting.

The management of the unit, supported by two central councils, is well defined and ensures optimal functioning of decision-making processes.

All the requirements regarding human resources management, career progress and safety are in place.

1/ The unit has set itself relevant scientific objectives and is organized accordingly.

2/ The unit has resources adapted to its scientific objectives, profile of activities and research environment and mobilizes them.

3/ The unit has premises, equipment and technical skills adapted to its scientific policy and research objects.

4/ The unit's practices comply with the rules and guidelines set by its supervisory bodies in terms of human resources management, safety, environment and data protection as well as scientific assets.

Context-related strengths and opportunities for the four references above

The main scientific objective of the unit is to conduct multi-disciplinary and translational research in order to develop new diagnostic and therapeutic tools for oncology. The organization of the unit in two teams with well-defined scientific objectives is adequate to achieve the set goals.

The first team (TATOO) is researching new targets and the development of imaging tools and targeted therapies, using *in vitro* or preclinical models. The second team (ROBUST) aims to identify and characterize new biomarkers, as well as to carry out the transition to the clinical level of radiopharmaceuticals developed or validated by Team 1. This organization requires close collaboration between the two teams, which sometimes can be seen as too much overlap between the two teams and requires vigilance so that both teams preserve their own identity. In terms of premises, the unit benefits from large lab and office spaces (> 2000 m²), gathered on a single site. The premises have recently been renovated, and the equipment is modern.

The activity of the two teams is based on a set of five technological platforms offering services covering a wide range of fields ranging from chemistry, radiochemistry, biochemistry, preclinical imaging and transfer to the clinic. All these platforms are led by members of the unit, assuring easy access to these resources. Some prestatation are performed for external partners, in particular for IVIA preclinical platform. The balance between external and internal project is well managed, while also ensuring additional financial revenue to the unit. Two central councils are in place for the unit's management: a scientific council that develops scientific policy and identifies funding axes, and an elected laboratory council that discusses and votes on the proposals of the scientific council. The two councils meet every six weeks, and their decisions are well accepted by the unit members. Human resources are significant and equitably distributed between the two teams and the different staff (technicians, engineers, researchers, etc.). The unit has mentioned in its activity report that the acquisition of a cyclotron is in progress. This project will undeniably expand the capabilities and performance of the unit. The committee understood that this project was well advanced at the time of the virtual visit and that the cyclotron should be operational by 2030.

There is an effective policy in place to support the career development of the unit's staff. All annual performance reviews are properly conducted by supervisors. In terms of human resources management and safety, the unit meets all the requirements set by the supervisory bodies. The unit mobilizes significant financial resources (> €7 million over the period evaluated) thanks to many financed contracts and a high success rate to call for research grants. There is also strong support from the anti-cancer center, although not in terms of funding but in terms of human resources, with 20 people affected to the unit, including 4 full-time researchers.

Context-Related weaknesses and risks for the four references above

The consensus was that the report was too long, with too many detailed scientific results, and overall lacked synthetic presentation, making it difficult to track the most important and impactful facts for the evaluation. There were also many repetitions throughout.

The unit is well staffed with 81 members (including 55 permanent staff) but representing 'only' 45 FTE, which denotes the imbalance between the single Inserm researcher (1 full FTE) vs university staff (MCU, PU) for such a unit. The number of full-time researchers (4, including only 1 for Inserm) is low compared to the overall number of staff in the unit. Even if the recruitment of an Inserm researcher is planned for the next contract, this remains uncertain due to the competitive nature of the recruitment of Inserm at national level. In short, the committee felt that a better/clearer strategy to attract and retain high-profile ECRs should be put in place to increase chances of recruiting Inserm CRCN in the next mandate.

It appears that the five platforms used by IMoST are mostly staffed by IMoST personnel (half-time) and that running/maintenance costs are mostly paid through the services provided by the platform, a significant part coming from IMoST projects. As IMoST seems to be the main user, there is a certain level of liability here for the platforms if IMoST funding was to suddenly diminish. While the number of technical staff may seem quite large, when considering the number of ongoing projects and the fact that most of this staff is affected part-time to the technical platforms, there is a risk of overload in managing internal and external projects.

The very large amount of equipment, including large pieces of equipment whose maintenance is expensive and, in particular for clinical activity, weigh heavily on the unit's budget. There is a risk here as this requires maintaining a high rate of fundraising to meet this burden.

EVALUATION AREA 2: THE UNIT'S SCIENTIFIC RESULTS, IMPACT AND ATTRACTIVENESS

Assessment of the unit's scientific results, impact and attractiveness

IMoST is engaged in highly competitive research in nuclear oncology. The strategy focuses on the characterization of biomarkers and the development of targeted molecular vectors with radiotheragnostic capabilities. Their program is supported by more than 570 publications, with 54% in eligible position. The publication quality is very good.

Clinical valorisation is noteworthy. However, the number of patents for molecules, etc. seems low.

The national impact and visibility are substantial, IMoST is the major driver of oncology research in UCA, but international engagement remains too low.

1/ The unit is recognized for its scientific achievements that meet quality criteria.

2/ The research activities of the unit result in quality scientific production.

3/ The unit participates in the coordination and management of its community.

4/ The unit's scientific production respects the principles of scientific integrity, ethics and open science. It complies with the guidelines applicable in this field.

Context-Related Strengths and Opportunities for the four references above

With over 570 publications and contributions to congress, the scientific achievements of IMoST are excellent. Notably, numerous publications are in a high-profile journal in the field of oncology or imaging (e.g. 7 Annals of Oncology, 1 New Engl. J. Med., 2 Lancet Rheumatology, 5 Lancet Oncology, 5 Annals of the Rheumatic Diseases, 1 Theranostics, 1 Journal of Nuclear Medicine, 2 British Journal of Dermatology). The number and the quality of the journals in which the results of the unit are published reflect a significant contribution to the various fields and a scientific production of high quality.

Overall, IMoST has numerous national collaborations and is involved in various local and national and some international networks, which contributes in part to the scientific production.

The overall strategy for data management and backup which integrate redundancy of site and support at server level is very well thought and organised. The unit is well aware of the limitations of their strategy as there is a certain and inevitable level of personal responsibility that falls on each personnel to comply with the unit policy. Considering the amount of imaging and other types of data that the unit must generate, this is definitely an exemplary organisation.

Regarding ethics, everything stated follows the standards in terms of clinical and experimental research and everything seems in place to continue adhering to the highest possible standards.

In terms of scientific integrity, the training provided to new incomers in the unit seems adequate.

Regarding Open Science and dissemination, the publications on open platforms such as HAL and open-access journal comply with the requirements and expectation of a publicly funded lab.

Context-related weaknesses and risks for the four references above

While the unit 'actively promotes open science', the implementation of Open Data (sharing data sets following the FAIR – Findable, Accessible, Interoperable, Reusable – criterion) is not performed yet.

EVALUATION AREA 3: INCLUSION OF RESEARCH ACTIVITIES IN SOCIETY

Assessment of the inclusion of the unit's research activities in society

The unit pays attention to intellectual property protection and has filed two patents, a third being prepared. As part of its collaborations, the unit systematically signs confidentiality agreements. The public engagement of the unit is good. The unit is highly active in clinical evaluation (150 trials). In the latter contract, the unit displays strong industrial partnerships (national and international, e.g. NOVARTIS, PFIZER). Moreover, the unit shows interactions with industrials through its platforms and facilities (CIRMEN, research clinical department of CLCC Jean Perrin and PARC-ARA).

1/ The unit stands out for the quality of its interactions with the cultural, and socioeconomic world.

2/ The unit develops products and services for the cultural, socioeconomic world.

3/ The unit shares its knowledge with the general public and participates in social debates.

Context-related strengths and opportunities for the three references above

IMoST actively shares its know-how with the cultural and socioeconomic world, particularly through public engagement activities, notably with cancer patients and their families. For the evaluation period, the unit led two events: OpenLabs: laboratory visits for patients and their families, and a Public Conference: 'Le cancer on en parle !'. One member of the unit is highly active in promoting and sharing the latest developments in cancer prevention, diagnosis and treatments with patients' associations. In this context, five conferences were given in Auvergne area and Paris. The same member is involved at the international level for actions for patients with metastatic breast cancers takes through her participation in the steering committee of ABC Global Alliance.

The unit is very active in translational research through its know-how and facilities in clinical trials in partnership with public (CHUs) and private pharma companies, including main imminent industrials (BMS, MERCK, NOVARTIS, PFIZER).

Context-related weaknesses and risks for the three references above

The unit contribution to the cultural and social world is obvious. However, the number of projects funded by industrial partners is low, and its interactions with the industrial sector are based mainly on the provision of services.

The committee also notes the lack of a science-society communication and interaction strategy, as well as the absence of a designated contact person within the unit for these tasks.

ANALYSIS OF THE UNIT'S TRAJECTORY

Created in 2017 through the merger of Inserm UMR 990 (Molecular Imaging and Vectorized Therapy) and the ERTICA team (Research on Individualized Cancer Treatments), IMoST combines expertise in radiolabelling, response biomarkers, and vectorized strategies.

The unit's trajectory is marked by a consolidation towards a personalized approach to molecular imaging and associated therapies, with the aim of moving from preclinical results to potential clinical demonstrations. This high-potential research is of great interest in oncology but also for other pathologies.

The unit strives to develop original radiolabels and innovative vectors, while identifying response and resistance biomarkers to guide therapeutic strategies and facilitate clinical transfer.

This scientific trajectory is consistent and accompanied by an appropriate management strategy. One of the potential limitations to tackle in the next mandate is to perform well in all research disciplines involved in the lab trajectory, e.g. research molecular and cellular biology, chemistry, analytic pharmacology, preclinical models, clinical research.

RECOMMENDATIONS TO THE UNIT

RECOMMENDATIONS REGARDING THE EVALUATION AREA 1: SCIENTIFIC OBJECTIVES, ORGANIZATION AND RESOURCES OF THE UNIT

The unit should define a clear strategy to attract (nationally or internationally) or retain the best candidates to apply to the Inserm yearly recruitment rounds (CRCN, ATIP Avenir, other fellowships). NB: numerous schemes do not allow candidates already in the lab to apply; recruitment, preparation and application must happen well in advance while the candidate is still abroad or in another lab.

Considering the numerous interactions with industrial partners, the unit should seek further support from UCA and Inserm to meet with industrial partners in order to secure more industrial funding and Cifre PhD studentships.

The committee understands the difficulty of implementing a full open-data strategy, especially with biomedical imaging modalities, but as this is increasingly requested by funding bodies, it is important to develop a strategy and plans upstream of studies starting to make this doable and manageable. A data management plan for the whole unit should be drawn up and used in all grant applications and then used in all projects.

RECOMMENDATIONS REGARDING THE EVALUATION AREA 2: THE UNIT'S SCIENTIFIC RESULTS, IMPACT AND ATTRACTIVENESS

The committee encourages the unit to:

- Improve international visibility by participating in board or scientific committees of international societies, organise or participate in organizing committee of international conferences.
- Create a social media account (e.g. LinkedIn) to reach out to international colleagues to engage with potential collaborators abroad and improve visibility.
- Set goals in terms of the number of EU applications to MSCA Doctoral Network, Horizon Europe program with international colleagues, existing collaborators or identified through the action above.

RECOMMENDATIONS REGARDING EVALUATION AREA 3: INCLUSION OF RESEARCH ACTIVITIES IN SOCIETY

The committee recommends to: increase the number of researchers and PhD students involved in public engagement activities to reach a broader audience, participation to the week-long national science festival (fête de la science). The committee believes that social media visibility should be improved to promote the unit achievements more broadly, which would also help gain international visibility, recognition and attractiveness.

TEAM-BY-TEAM ANALYSIS

Team 1: Targets and tools for imaging and therapy (Tatoo)
Name of the supervisor: Mr Emmanuel Moreau

THEMES OF THE TEAM

The team's activities focus on the design of innovative molecular imaging biomarkers, radiopharmaceuticals and therapies and their preclinical validation using *in vitro* (molecular and cellular targets) and *in vivo* models. The developed tools are mainly applied to oncology but also cartilage pathologies (osteoarthritis, polyarthritis). To achieve this, the team develops its research in a multidisciplinary context bringing together chemists (organic, medicinal chemists, pharmacologists and analysts), crystallographers, biologists and clinicians.

CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Almost all the recommendations of the previous contract concerned the unit as a whole. Only one recommendation directly concerned Team 1: recommendation 8, *the radiolabelling axis of antibodies and derived products must be strengthened by national synergies*. The team's projects have been supported by the ANR and the French League Against Cancer, indicating a certain level of synergy with other French laboratories. Therefore, we consider that the team has fulfilled the recommendation.

TEAM WORKFORCE: IN PHYSICAL PEOPLE AS OF 31/12/2024

Staff categories	People
University professors and equivalents [Fr: Professeurs et assimilés]	8
Lecturers and equivalents [Fr: Maitres de conférences et assimilés]	10
Research Director and equivalents [Fr: Directeurs de recherche et assimilés]	0
Research Officer and equivalents [Fr: Chargés de recherche et assimilés]	1
Support personnel for research (e.g. engineers) [Fr: Personnels d'appui à la recherche]	13
Hospital practitioner [Fr: Praticien hospitalier]	4
Subtotal permanent active personnel	36
Lecturers-researchers and non-permanent researchers and equivalents [Fr: Enseignants-chercheurs et chercheurs non permanents et assimilés]	2
Non-permanent support staff [Fr: Personnels d'appui non permanents]	1
Postdoctoral Researchers [Fr: Post-doctorants]	0
Doctoral students (PhD candidates) [Fr: Doctorants]	5
Subtotal non-permanent personnel	8
Total	44

EVALUATION OF THE TEAM

Overall assessment of the team

Team 1 focuses on the validation of preclinical biomarkers and tracers and their translation to the clinic, achieved through multidisciplinary collaborations. The team's funding is excellent (approx. 1.9M€ /5 years). The scientific production is also excellent (262 articles), some publications together with team 2 (NB: although not easily identifiable in the report). The level of public outreach is good, focusing on cancer patients and their families. The level of training provided is also good with 35 M2, 14 theses including 5 in progress and 5 postdoctoral students and offers a broad range of training to staff.

Context-Related Strengths and Opportunities

The team has an excellent scientific output resulting from collaborative (locally and with Paris Sorbonne, Lyon, Tours, and industrial: Merck) and translational research, funded by numerous, mostly, national and few international grants (totalling to approx. 1.9M€). There is a regular steady output in terms of publications (30-50/year; 262 over 5 years for the team over 577 for the unit, 31%).

For example, the potential of NTP-15-5 for assessing the structural efficacy of new drugs has been supported by the ANR and the French League Against Cancer. In addition, the proof-of-concept for retargeted radioimmunotherapy has involved collaboration with the City University of New York.

The team's public engagement is greatly appreciated. Within the evaluation period, they co-organized the first session of OpenLabs, offering opportunities for laboratory visits for patients and their families. Also, team members took part in a public Conference entitled 'Le cancer on en parle !' in collaboration with the Clermont-Ferrand International Film Festival.

Context-related weaknesses and risks

Overall, the team is very strong, and the only identified weakness is that despite collaborations with industrial partners, the team has no Cifre PhD studentship or funding from industrial contracts (none were listed in the report).

The team has numerous national collaborations but only one international, which would hamper their abilities to participate in international consortia and network.

ANALYSIS OF THE TEAM'S TRAJECTORY

The Tatoo team proposes to structure its research around three main axes defining a coherent and ambitious research program that spans the entire translational chain of targeted radionuclide therapy (TRT), from molecular design to biological validation and clinical integration. Axis 1 establishes the chemical and radiochemical foundations by developing and validating innovative ligands and vectors for theragnostic applications. Axis 2 deepens the understanding of TRT mechanisms by linking radiochemistry with radiobiology, combining experimental and modelling approaches to quantify dose–effect relationships and support personalized dosimetry. Axis 3 builds upon these developments to enhance therapeutic effectiveness through biological modulation and combination strategies, bridging preclinical innovation with clinical translation.

The team is clearly positioning itself along a coherent and ambitious translational trajectory, progressively integrating molecular design, mechanistic understanding, and preclinical-to-clinical development in TRT. Its structured strategy aims to establish full expertise across the entire value chain, strengthening its capacity to become a key player in targeted radiotherapy.

RECOMMENDATIONS TO THE TEAM

The committee recommends to:

- Reinforce collaboration with industry in order to obtain industrial funding through Cifre PhD studentships or contracts.
- As for the unit, improve international visibility to obtain EU funding or be invited to participate to consortia.

Team 2: Translational Research in functional imaging, radiopharmaceuticals and theragnostic biomarkers (RoBust)
Name of the supervisor: Mr Florent Cachin

THEMES OF THE TEAM

Translational Research in functional imaging, radiopharmaceuticals and theragnostic biomarkers.

CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The recommendations from the previous evaluation were

1. Risk of projects dispersion across the two teams/lack of synergy.
2. Invite more national and international speakers to reinforce internal communication and synergy between the different fields of the team.
3. Maintain and increase the translational aspects between the two teams.
4. Take all the opportunities to collaborate with industrial partners: Can still be improved.
5. Partnership with Cyclopharma was a risk because of its takeover.
6. Organisation of retreats and seminars to improve communication between members that have broad and heterogenous background.
7. Implementation and use of new techniques (3D culture, AI assisted image analysis, etc.).
8. Clarify the organisation of staff around projects to enhance efficacy.
9. Formal and regular update on the progression of the project to avoid dispersion of personnel and resources.

The committee has noticed the team's efforts to address the previous recommendations. Specifically, the translational collaborations between the two teams have been developed and the goals and results have been achieved.

The partnership with Cyclopharma, now Curium, is no longer a risk and has been transformed into a highly structuring project.

However, the committee believes that a risk of dispersion remains among research projects together with a risk of losing the synergy between them.

TEAM WORKFORCE: IN PHYSICAL PEOPLE AS OF 31/12/2024

Staff categories	People
University professors and equivalents [Fr: Professeurs et assimilés]	9
Lecturers and equivalents [Fr: Maitres de conférences et assimilés]	6
Research Director and equivalents [Fr: Directeurs de recherche et assimilés]	0
Research Officer and equivalents [Fr: Chargés de recherche et assimilés]	3
Support personnel for research (e.g. engineers) [Fr: Personnels d'appui à la recherche]	11
Hospital practitioner [Fr: Praticien hospitalier]	13
Subtotal permanent active personnel	42
Lecturers-researchers and non-permanent researchers and equivalents [Fr: Enseignants-chercheurs et chercheurs non permanents et assimilés]	0
Non-permanent support staff [Fr: Personnels d'appui non permanents]	5
Postdoctoral Researchers [Fr: Post-doctorants]	2
Doctoral students (PhD candidates) [Fr: Doctorants]	14
Subtotal non-permanent personnel	21
Total	63

EVALUATION OF THE TEAM

Overall assessment of the team

The RoBust team is a highly active research group strongly focused on translational research in oncology and nuclear medicine. There is a good level of interaction with Team 1 and strong clinical activities within the team.

Context-Related Strengths and Opportunities

The research project of RoBust team is highly translational and integrates complementary skills including chemists, biologists, physicists, pharmacists and physicians. The team has access to biology and imaging platforms and to CIRMEN radiopharmacy dedicated to First into Human clinical studies. The organisation of the team's life is well managed with monthly meetings organized to share expertise and discuss of funding strategies. The selection of future Master 2 and PhD projects are made by scientific and unit councils. Small Task groups led by coordinators discuss the ongoing projects and ensure an efficient project management strategy.

The capacity of the team to raise funds is remarkable, with 4.8M€ obtained during the period. The existence of many small 'pot' of funding listed in the report, corresponding to smaller applications or internal funding and used to perform pilot experiments in order to obtain preliminary data for larger grant application is clearly a strength.

In terms of achievements, it is noticeable that two radiotracers ([^{99m}Tc] Tc-NTP15-5 targeting proteoglycan and [¹³¹I] ICF01012 for melanin) have been ported to clinical level and validated after their preclinical development by Team 1, illustrating the collaborative links between the two teams of the unit.

Context-related weaknesses and risks

The general comment applying to the unit in terms of a limited number of full-time researchers seems particularly prominent in Team 2 in which the large majority of research staff is university or medical staff. Three full-time researchers are provided by the anti-cancer center.

Axis 2 'Translational research in nuclear medicine' is highly dependent on Team 1's results in terms of development, qualification and validation of new radiotracers. There is also a clear dependency on the CIRMEN platform that might constitute a risk.

A risk of dispersion has been highlighted by the committee, particularly in Axis 2, which should remain focused on clinical studies or research on human materials. For example, in project 2.3 'Radiobiology assay dedicated to TRT', the fundamental approach with the use of preclinical models seems more in line with the themes of Team 1. Although the committee is aware that this risk is to be balanced with the need for collaborations between the two teams as this will enhance the level of team interaction.

The visibility of Team 2 is still almost entirely national. International visibility must be improved to enhance chances to participate to EU consortia, etc.

Given the steps required to bring radiopharmaceuticals from preclinical use to first into human injection, another potential risk is the ability of CIRMEN platform to face the increasing regulatory requirements and costs.

ANALYSIS OF THE TEAM'S TRAJECTORY

The three research axes will be reorganized in

1. Translational nuclear medicine,
2. Biomarkers and targets in immuno-oncology,
3. Tools for personalized medicine.

This will constitute a strong framework to face the evolution of nuclear medicine for the next decade, i.e. the anticipated rapid development of TRT.

Axis 1 projects fit perfectly with this strategy and will benefit from team expertise and multidisciplinary skills to conduct phase II/III clinical trials, with the support of CIRMED experimental radiopharmacy, and validate new radiotracers. Three candidate radiotracers have already been identified for clinical transfers and evaluation. The development of innovative alpha therapies as well as the evaluation of the impact of TRT on male fertility will strengthen Axis 1 and consolidate the Robust team's expertise on TRT.

Axis 2 is highly dependent on the activity and success of Team 1 as new biomarkers/targets and corresponding tracer discovery is the core activity of Team 1. However, Team 1 is very active and has numerous projects; therefore the committee is confident that translation of their findings into clinical applications should be successful at short and mid-term.

Axis 3 is certainly the most challenging but also the most rewarding in terms of publication and scientific and societal impact as demonstrated by the publication of high impact papers during the last mandate. Considering the regular flow of new biomarkers or therapeutic/target agents developed by Team 1 and translated by Team 2, this activity should be steady or grow in the next mandate.

RECOMMENDATIONS TO THE TEAM

1. The unit directory team should ensure that future recruitment of full-time researchers by the unit is equally balanced between teams. Team 2 should have a clear strategy of attracting high-profile candidates (at postdoctoral level) to maximise the chance of success at Inserm recruitment phase.
2. Although there is a need for some overlap between the 2 teams' activities to ensure the translation and back translation, it will be necessary to monitor the risk of dispersion closely in Team 2 so that Team 2 activities do not go too much into Team 1 activities. Team 1 must remain the main preclinical/fundamental team while Team 2 must be kept as the clinical one.

CONDUCT OF THE INTERVIEWS

DATE

Beginning: 13 novembre 2025 à 8 h 45

Ending: 13 novembre 2025 à 16 h 30

Interview conducted: remotely

PROGRAMME OF THE INTERVIEWS

Jeudi 13 novembre

- **8:45 a.m.-9 a.m. Committee Closed session**
- **9 a.m.-9:10 a.m. Président comité Presentation of the evaluation process**
- **9:10 a.m.-9:30 a.m. E. Miot-Noirault IMoST presentation: self-assessment and trajectory**
- **9:40 a.m.-10 a.m. Questions**
- **10 a.m.-10:30 a.m. E. Moreau Team 1 presentation: self-assessment and project**
- **10:30 a.m.-10:40 a.m. E. Moreau Focus point Team 1**
- **10:40 a.m.-11 a.m. Questions**
- *11 a.m.-11:20 a.m. Break*
- **11:20 a.m.-11:40 a.m. F. Cachin Team 2 presentation: self-assessment and project**
- **11:40 a.m.-11:50 a.m. F. Cachin Focus point Team 2**
- **11:50 a.m.-12:10 p.m. Questions**
- *12:10 p.m.-1 p.m. Lunch break*
- **1 p.m.-1:30 p.m. TBD Melanoma as example of cross-team translational research**
- **1:30 p.m.-1:45 p.m. Questions**
- **1:45 p.m.-2:15 p.m. Meeting with trustees**
- **2:15 p.m.-2:45 p.m.**
 - J. Redouté & D. Brasse **Meeting with technical staff (ITA/BIATSS)**
 - S. Annunziata & F. Paris **Meeting with researchers & lecturers**
 - H. Boutin & A. Boumendjel **Meeting with PhD students and postdoctoral students,**
- *2:45 p.m.-3:15 p.m. PAUSE*
- **2:45 p.m.-3 p.m. Committee Closed session**
- **3:15 p.m.-3:45 p.m. Final meeting with directory board of IMoST**
- **3:45 p.m.-4 p.m. Presentation of the summary of the evaluation meeting**
- **4 p.m.-4:30 p.m. Committee Closed session**

GENERAL OBSERVATIONS OF THE SUPERVISORS

The institution responsible for submitting the application, which is also responsible for coordinating the response on behalf of all the research unit's supervisors, did not submit any general observations.

Evaluation of universities and schools
Evaluation of research units
Evaluation of the academic formations
Evaluation of the national research organisms
Evaluation and International accreditation



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