Research evaluation

EVALUATION REPORT OF THE UNIT

LAI - Laboratory Adhesion & Inflammation

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Aix-Marseille université - AMU

Centre national de la recherche scientifique - CNRS

Institut national de la santé et de la recherche médicale - INSERM

EVALUATION CAMPAIGN 2022-2023

GROUP C

Report published on July, 17 2023

In the name of the expert committee[1] :

Virgile Viasnoff, Chairman of the committee

For the Hcéres[2] :

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29th November 2021:
[1] The evaluation reports "are signed by the chairperson of the expert committee". (Article 11, paragraph 2);
[2] The president of the Hcéres "countersigns the evaluation reports established by the expert committee and signed by their chairperson." (Article 8, paragraph 5).

This report is the result of the unit's evaluation by the expert committee, the composition of which is specified below. The appreciations it contains are the expression of the independent and collegial deliberation of this committee. The numbers in this report are the certified exact data extracted from the deposited files by the supervising body on behalf of the unit.

MEMBERS OF THE EXPERT COMMITTEE

Chairperson:	Mr Virgile Viasnoff, CNRS, Singapour
Experts :	Mr Guillaume Montagnac, Inserm, Villejuif (representative of CSS Inserm) Ms Nadine Nassif, CNRS, Paris Ms Judith Peters, Université Grenoble Alpes (representative of CNU) Mr Jean-Baptiste Sibarita, CNRS (supporting personnel)

HCÉRES REPRESENTATIVE

Ms Birke Bartosch

CHARACTERISATION OF THE UNIT

- Name: Laboratory Adhesion & Inflammation
- Acronym: LAI
- Label and number: Inserm U1067/ CNRS UMR 7333 / AMU UM61
- Composition of the executive team: Mr Olivier Théodoly-Lannes

SCIENTIFIC PANELS OF THE UNIT

SVE4: Immunity, Infection and Immunotherapy

ST2: Physics

THEMES OF THE UNIT

The unit focuses on physics of immunology, and has developed 4 themes around these thematics:
1-molecular interactions
3-cell activation and mechanics
3-cell migration
4- Transfer to medicine
All of these themes are developed in the context of immune cells.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The Inserm unit LAI ("Laboratoire Adhesion & Inflammation") was founded in 1994 within the Hospitals of Marseilles with the strategical aim to gather in the same laboratory researchers with backgrounds in medicine, biology and physics. This pioneering structure bridging physics and medicine was extended into a CNRS unit ("Unité Mixte de Recherche") in 2005. The increase of staff members motivated the installation of fundamental research activities on the scientific campus of Luminy. The unit has ever since two locations, one for fundamental research at Inserm TPR2 building in Luminy and another for medical transfer at the Marseilles hospitals in the "service d'immunologie" of AP-HM.

RESEARCH ENVIRONMENT OF THE UNIT

LAI is a pioneer contributor in the interdisciplinary fields of biophysics and biophysics applied to medicine. LAI is a founding member of the Labex INFORM (12 labs- 2013-2017) and the Projet ANR Convergence CENTURI (20+ labs, 2017-now), as well as member of two AMU institutes: Institute Marseille Imaging, Institute Onco-Immunology. LAI is member of the Hospital institute "Biogenopole" and the hospitalo-university institute "Immunopole".

UNIT WORKFORCE: in physical persons at 31/12/2021

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	4
Senior scientist (Directeur de recherche, DR) and associate	2
Scientist (Chargé de recherche, CR) and associate	2
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	6
Subtotal permanent personnel in active employment	**14**
Non-permanent teacher-researchers, researchers and associates	4
Non-permanent research supporting personnel (PAR)	0
Post-docs	2

PhD Students	15
Subtotal non-permanent personnel	**21**
Total	**35**

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: NON-TUTORSHIP EMPLOYERS ARE GROUPED UNDER THE HEADING "OTHERS".

Employer	EC	C	PAR
Aix-Marseille université - AMU	4	0	0
CNRS	0	2	3
Inserm	0	2	3
Total	**4**	**4**	**6**

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	764
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)	856
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	1 430
Own resources obtained from international call for projects (total over 6 years of sums obtained)	2 716
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	0
Total in euros (k €)	5 766

GLOBAL ASSESSMENT

The LAI is as a small, dynamic and singular unit. It is a rare - if not unique example - for a unit connecting biophysics with medicine. As a whole, the unit is perceived as very interdisciplinary and very well integrated into the AMU landscape. The breadth of biophysical techniques dedicated to the understanding of fundamental problems in immunology is very unique and competitive. The concerted, organized and prolonged efforts to reach out to the hospitals has been largely appreciated by the panel members.
The interviews with the team members testified of a high degree of satisfaction and well-being in the lab at all levels. The issue of three statutory researchers leaving the team to create an independent Inserm unit arises from a thematic divergence and different vision of unit organization. Both, unit members and the supervising institutions have already settled the planned fission in a reasonable way. The arrival of new researchers in the unit in this quinquennial, testifies of the unit's dynamism, reinforces the biological themes of the unit and has been carefully crafted. The panel judges that the flow of personnel is not at all compromising the activity of the unit.
The four themes Molecular interactions, Cell activation & mechanics, Cell migration and Transfer to medicine are developed in the context of immune cells, are complementary and relevant to the global policy of the unit to keep its originality: biophyics for immunology and diagnostics.

The national and international visibility and attractivity of the unit has been greatly strengthened with invitations of unit members to 35 international conferences and 17 seminars, CNRS schools and workshops in France and 1 seminar abroad. Unit members have also assisted in the organization of EMBO Immunobiophysics 2021, international seminar series on Immunobiophysics and Mathematical Biology Conference (Marseille 2020). However, LAIs visibility needs to be further improved at the unit level as well as in respect to its individual researchers.

The LAI has also been involved in an European Network for biophysics (funded project H2020-ITN-MSCA) and a collaboration with the University of New Mexico (CNRS PICS (2018-21) / IRP (2022-27) including long term staff exchanges) and been able to attract PhD students and postdocs through these networking activities. LAI trained 11 post-docs and 13 PhD students over the evaluation period. Their employability after their stay at LAI is excellent. For instance, among the 15 post-docs that finished during the quinquennial, almost all found a job, and among the 10 PhDs, 50% found a job in private companies, 10% obtained a post-doc position and 20% are following a formation.

The funding level is excellent. During the evaluation period, LAI obtained regional or national (e.g. 9 ANR (6 as leaders), 3x Amidex, 2x Region PACA, AORC from Marseilles Hospitals), European (ERC consolidator, H2020 coordinator, Hubert Curien Cèdre, HFSP), and international grants (PICS/ IRP coordinator), summing up to a total of about 5 million €. A laboratory member obtained an ATIP-AVENIR contract, and the unit is founding member of the Labex INFORM, and Convergence Institute CENTURI.

Over the evaluation period the unit had an excellent scientific production with 71 publications of high quality mostly in high profile journals. Importantly, each thematic of the unit has published in prestigious journals (e.g. 2 *Nature* as collaborators, 2 *Nature Physics* including one as first/corresponding author, 3 *Nature communications* including one as first/corresponding author, 5 *PNAS* including 4 as first author and 3 as corresponding author) and/or in leading journals in the designed fields (e.g. 8 *Biophysical journal, Embo reports, Optics letters*, 2 *ACS Nano*, 3 *Nano Letters*).

The industrial links of LAI are excellent (3 industrial contracts for a total of 96 k€), for co-development (Alveole, JPK/Bruker, Nanolane) or commercialisation of a product (Idylle). One patent was issued during the evaluation period and 2 have been prepared for deposition in 2022. The translational lab embedded in the hospital allows LAI to efficiently test their biophysical methods as on-site diagnostic tools.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Recommendation: LAI researchers could utilize their excellent track record to secure permanent visibility and international impact of the unit. Building on the excellent working atmosphere, LAI can further develop a research plan more coherently connecting different activities of "in house", and within the international community.

This recommendation was fulfilled by the recruitment of 3 new scientists over the period.

Recommendation: Further effort to develop international interactions and to participate to international networks (for instance by applying to European grants) would be desirable to increase the international impact of LAI research activities and attract more postdocs.

The panel noticed progresses into the matter, notably the participation in one European network. Further improvements are encouraged to make the unit even more connected, attractive and visible.

Recommendation: LAI should reinforce the link with the hospital by stimulating the interactions with clinicians and by replacing the retiring assistant engineer.

The ITA was replaced. The links with the hospital remain solid albeit the departure of some clinicians. The unit maintains a very active translational activity in its lab-space embedded in the hospital La Timone.

Recommendation: A top priority for LAI would be to attract permanent staff with priority for molecular/cellular biologists and medical doctors dedicated to the clinical translation of some of the unit's projects. Given the fact that the biological system at the heart of the scientific design of the unit is the T lymphocyte, the institute would greatly benefit of recruiting a couple of specialized immunologists with motivation to translate their expertise on the biology of T cells to using biophysical approaches address fundamental or clinically-oriented questions. It is also essential to maintain and further foster a strong and solid connection to the clinical activity. In addition, several improvements could be easily introduced to make the environment of LAI more dynamic: - increase the frequency of external seminars, involving younger staff in the organization; - improve the website.

The proper recruitment following the recommendation of the previous report have been successful and will strengthen the biological and immunological part of the research. Based on information obtained in the visioconference, the frequency of external seminars has not changed but LAI will greatly benefit from the environment of CENTURI. The LAI website still needs improvement to boost the unit's attractivity.

Recommendation: The expert committee recommends to increase the appeal of LAI to post-docs by strengthening the national and international network.

Over the last five years the number of postdocs and PhD students have increased. The discussion with the post-doc and PhD students showed that the lab has been recommended to them, hence their decision to join.

Recommendation: LAI is a small laboratory and the question of its positioning within the local context should be addressed in particular with respect to CIML and with respect to the development of activities at the physics and biology interface at CINaM and probably other laboratories within AMU. More specifically owing to the general scientific direction of the LAI, the experts committee suggests the recruitment of a computational scientist and of cellular immunologists, which would help to better exploit the originality of the unit's approaches and to connect their approaches to some of the most debated questions in the field of T lymphocyte biology. In order to avoid a risk of dispersion, the committee suggests that each researcher should lead one "convergence project/bridging scale" project and maintain "medical translation". For this latter task, the team of PI needs to build on existing strategies to facilitate exploitation of lab data/expertise towards clinical application

The representatives of the supervising institutions were very supportive to the unit's policy and are satisfied with the recent recruitments (that can always be better). They recognized and appreciated the interdisciplinarity of the unit, its small size and the way it functions. The new recruited PI (in the field of AFM, Cell Biology, NeuroBiology and adhesion) strengthens the thematic coherence of the unit.

B - EVALUATION AREAS

EVALUATION AREA 1: PROFILE, RESOURCES AND ORGANISATION OF THE UNIT

Assessment on the unit's resources

This criterion is evaluated as excellent.

Assessment on the scientific objectives of the unit

This criterion is evaluated as outstanding.

Assessment on the functioning of the unit

This criterion is evaluated as excellent.

1/ The unit has resources that are suited to its activity profile and research environment.

Strengths and possibilities linked to the context

The work force of the LAI unit comprises 38 members in December 2021 (without interns), including 8 permanent researchers (2 CNRS research directors, 2 Inserm "chargés de recherche", 4 Aix Marseille university "maîtres de conférences"), 3 permanent technical staff agents (1 CNRS "ingénieur d'études", 1 Inserm "Ingénieur de recherche, and 1 Inserm "assistante ingénieur"), 1 Permanent Inserm technician affiliated at LAI and mutualised between 4 Inserm Units, 2 non-permanent technical staff agents, 11 post-docs and 13 PhD students.

Regarding funding, the LAI receives 130 k€ of recurrent funding from its supporting institutions (Inserm, AMU, and CNRS. Research from the lab runs on an average of 800 k€ per year originating fromgrants for a total of 5 million € raised over the considered period. The unit mutualizes around 20% on the consumable budget of each individual grant that is then redistributed to each researcher or used for common acquisitions.
The unit attributes a part of the recurrent funds obtained from the supervising bodies to each permanent researcher and research engineer. The unit funds all the expenses to sustain shared biophysical tools within LAI, and shared platforms in the Inserm TPR2 building (i.e.common cell culture and cytometry platforms).
The unit promotes collective research by assigning each technical staff agent with a special set of missions that addresses transversal needs (e.g. cytometry analysis, FACS, cell transfection, microscopy, medical transfer applications). A special support is also dedicated to new researchers to help them start new projects.
The unit is very well funded and increased its work force during the last contract in the form of more PhD students and postdocs. The funding level is impressive given the small unit size.

Weaknesses and risks linked to the context

3 researchers from the unit will leave LAI to create their own Inserm unit because they want to find a form of freedom they do not have in LAI. This is a risk for the unit as these 3 researchers represents 1/4th of the total pool of LAI researchers, which also includes 4 maîtres de conference. Thus this departure may reduce the capacity of the unit to conduct competitive research. However, LAI has already compensated the future loss by recruiting 3 new researchers.

2/ The unit has set itself scientific objectives, including the forward-looking aspect of its policy.

Strengths and possibilities linked to the context

With a strong biophysics background, the scientific objectives of the LAI are clear and well defined and oriented towards both fundamental and applied research in an integrated manner. The unit has an excellent publication track record and its science is recognized both at the national and international level as exemplified by the gain of one ERC and the organization and participation to several international conferences.
The LAI is a multidisciplinary research unit composed of investigators with backgrounds in physics, biology and medicine, supported by the French national institute of health (INSERM), the National Centre for Scientific Research (CNRS) and the university of Aix-Marseille (AMU). Its main scientific orientation is to adapt physical concepts and methodologies to achieve a quantitative understanding of cellular functions, notably cell adhesion and migration in the immune system. The biophysical concepts and methodologies of this fundamental research are then transferred to relevant analysis of clinical problems and valorised into innovative diagnostic processes.
The LAI is a single-team unit whose scientific activity is structured around four main thematics that focus on immune cell functions at different spatio-temporal scales:
-The thematics of 'molecular interactions' concerns structural and dynamical effects of adhesion at the single molecule level.
-The thematics of cell activation and mechanics studies cellular signalling in response to external stimuli.
-The thematics of cell migration focuses on immune cell propulsion and guidance mechanisms that allow an efficient patrolling and recruitment in the whole human body.
-The thematics of transfer to clinic to value the fundamental aspects of the research developed in the lab into clinically relevant tests.
There are many fundamental bridges between these thematics and multiple projects are developed and encouraged between the investigators.
The research developed within these themes is quite unique and innovative. It leverages tools and approaches that are usually applied to epithelial cells but apply them in the context of immunology. This creates the unique opportunity to develop new diagnostic tools. The long lasting expertise of the unit bridging biophysics to clinics is rather unique in the French context and competitive in an international context as shown by the quality of the collaborations and publications.

Weaknesses and risks linked to the context

A small unit has a limited power for certain actions like the attraction of new skills, which may represent a risk for the development of future projects.

3/ The functioning of the unit complies with the regulations on human resources management, safety, the environment and the protection of scientific assets.

Strengths and possibilities linked to the context

The functioning of the unit complies with the regulations on human resources management, safety and environmental issues.
Two people are correspondents in the unit of the mission "Parité, Égalité Professionnelle" at Inserm. Their mission is to disseminate information and raise awareness of these issues among staff (information meetings, posters, etc.). Each new employee of the laboratory receives all the information related to the functioning of the laboratory. A panel dedicated to risk prevention displays general information and the names of contacts (prevention assistant, prevention medicine, psychosocial risk, crisis cells, CHSCT members).
One researcher acts as the local contact for the different IT systems. A server will be bought to strengthen data storage and accessibility.
Another researcher of the unit is in charge of climate change and ecological issues. In addition, an analysis of the carbon footprint of the unit activity will be performed, according to the template provided by the CNRS and Labos1point5 association.
In brief, the unit fully complies with all the requirements for safety, HR and CSG, which is an achievement given its size.

Weaknesses and risks linked to the context

The acquisition of a server for the unit seems absolutely required to ensure proper data storage and internal accessibility, especially for a unit that is located on two different sites.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The unit is excellent in terms of attractivity due to the well-organized platforms, the employability of the PhD students and post-doctoral fellows and the know-how of its researchers.

1/ The unit has an attractive scientific reputation and contributes to the construction of the European research area.

Strengths and possibilities linked to the context

Despite the rather small number of members, the unit is very active with respect to presentation at conferences, organisation of events or participation of research steering. The proportion of young scientists (PhD students and post-docs) is high and their employability after the stay at LAI is very good. For instance, among the 15 post-docs that finished during the quinquennial, almost all found a job, and among the 10 PhDs, 50% found a job in a private company, 10% got a post-doc, 20% are following a formation.
The members are able to attract regularly grants and funding from European (ERC consolidation grant) or national (ANR) sources and are founding member of a Labex. The unit runs successfully the culture cell platform (PCC) and shares technical staff with Inserm for that.
Lab members were invited to 35 international conferences, 1 seminar in a foreign country and 17 seminars, CNRS schools and workshops in France such as CENTURI Workshop 2017, EMBO Immuno-biophysics 2021, international seminar series on Immuno-biophysics, or the CENTURI Workshop 2022, AFM BioMed scummer school 2016,/18/20/22 and CellMech conference 2023. The unit has actually 38 members, among them 24 PhD students and post-docs.
Members of the unit have participated in scientific committees of international conferences (EMBO Immunobiophysics 2021, international seminar series on Immunobiophysics, Mathematical Biology Conference - Marseille - Feb. 2020) and organized events such as CENTURI Workshop 2017, EMBO Immuno-biophysics 2021, international seminar series on Immuno-biophysics, the CENTURI Workshop 2022, AFMBioMed scummer school 2016 and CellMech conference 2023.
Three members of the unit are associated editors in *Frontiers in Immunology*, and 1 as senior editor. Members of the unit have taken part in research steering committees such as the CNRS Comité National Section 11, the steering committees of Labex Inform and Turing Centre CENTURI and are board member of GDR Imabio and GDR AQV. These important activities in steering committees are mainly at the national level, in contrast to project reviewing, which was done on the European and international levels (European Research Council-ERC, Israel Science Foundation, the Belgium Fund for Scientific Research – FNRS, the Spanish Agencia Estatal de Investigación, the Netherlands Organisation for Scientific Research, the Austrian Science Fund (FWF), the Niewodniczański Institute of Nuclear Physics Polish Academy of Sciences, the Executive Board of the Austrian Science Fund, the Rumanian Executive agency for higher education).
In 2022, one lab member was awarded the crystal medal of the CNRS, thus increasing the unit's visibility.

Weaknesses and risks linked to the context

Although the lab members have a high level of local of collaborations with very valuable colleagues, we believe that the limited number of established collaborations with European researchers might limit the laboratory at the European scale. In turn it might be more difficult to apply for European grants. We believe that the LAI could answer more to calls for proposals for international cooperation and financing to invite scientists (and their PhD students) from abroad. The unit could benefit from more efforts in communication of the results to increase its visibility and exchanges.

2/ The unit is attractive for the quality of its staff hosting policy.

Strengths and possibilities linked to the context

The unit has actually 38 members, among them 24 PhD students and post-docs. The PhD students were or are affiliated to Aix-Marseille-University during the Master or attracted thanks to personal contacts. The PhD students and post-doctoral fellows are French or from Lebanon, Italy, Mexico, Spain, China, Argentina, Belgium, Monaco, Cuba, India, Turkey, South Korea, Philippines, Germany, Austria. New Foreign PhD students are often applying to LIA following word of mouth of former PhD or master students. They are affiliated to the doctoral schools of physics, life sciences and health and mathematics. Since 2016, there were 1 to 3 PhD defences per year at LAI for 6 to 17 PhD students per year. 4 to 10 post-docs were present between 2016 and 2022. There is a strong mentoring culture in the unit. Two statutory researchers passed their HDR in the last quinquennial, bringing the total number of HDRs in the unit to 10. All researchers are encouraged to pass their HDR.

The further employability of the students and postdocs from LIA is excellent with follow up employment both in the private and public sector. Exact number have been given in paragraph 1.

The unit has attracted talented candidates to apply for CNRS and Inserm positions. Several of them eventually got a permanent position in other institutes, one in AMU and two at the CNRS. One candidate got a position with LAI from the CNRS. A unit member obtained an ATIP-Avenir grant and has joined the CNRS in 2022 at LAI.

Weaknesses and risks linked to the context

No co-direction or co-supervision agreements are mentioned.

3/ The unit is attractive because of the recognition gained through its success in competitive calls for projects.

Strengths and possibilities linked to the context

One lab member has obtained an ATIP-Avenir program grant.
During the evaluation period, LAI obtained the following international grants: ERC consolidator grant (2 M€, coordinator at LAI), HFSP (261 k€, partner), PICS/IRP (21 k€, coordinator), Marie-Curie-Amidex 3 contracts, 2x coordinator, 1x partner, 460 k€ in total), Europe com. H2020 (185 k€, coordinator), Hubert Curien-Cèdre. The unit is founding member of the Labex INFORM, and Convergence Institute CENTURI.
The unit obtained 9 ANR projects in the evaluation period and lead 6 of them for a budget of 1.4 M€ in total. The unit is also supported by grants from AMIDEX (3x), Region PACA (2x), Labex INFORM (PhDs), CENTURI (PhDs, Postdocs), and Marseilles Hospitals (AORC, grant to support innovation). The unit has occasionally funded non-permanent technical agents for mutual functions: one engineer (9 months) to produce proteins and 1 technician (15 months) to produce transfected cells.
The funding level is hence excellent and amounts to a total of about 5 million €.

Weaknesses and risks linked to the context

The interdisciplinary nature of the research programs of the unit do not make them highly competitive for ministerial scholarships attributed by the doctoral schools at AMU since those remain quite focused on traditional scientific fields. Although the landscape is changing, LAI could propose more classically oriented projects conducted in an interdisciplinary environment to tapper into these funding resources. Their current financing scheme based predominantly on research grants seems however sufficient to maintain a good activity and financing of young researchers in the lab.

4/ The unit is attractive for the quality of its major equipment and technological skills.

Strengths and possibilities linked to the context

In partnership with 4 other Inserm units, LAI manages a culture cell platform (PCC), a cytometer and a FACS that are open to external units and industrials. The unit also uses and participates to the equipment of microfabrication services of the clean room platform PLANET (AMU certified platform).

The unit shares 6 technical staff to manage platforms mutualized with 4 Inserm units within the TPR2 building:

-1 agent affiliated to LAI is in charge of a culture cell platform (PCC);
- 2 agents manage the animal facility (mutualized with 4 Inserm units);
- 2 agents manage cleaning facility (mutalized with 4 Inserm units);
-1 agent is in charge of secretarial work.

1 "Ingénieur de recherche" was hired by Inserm in 2021 to manage the park of microscopes and optical instrument of the unit (affiliated for 30% of its activity at LAI).

It appears that the LAI is well equipped and has a good local network for the use of its platforms.

Weaknesses and risks linked to the context

We did not detect any weakness on this topic.

EVALUATION AREA 3 : SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The scientific production reflects the interdisciplinary nature of the unit and is excellent.

1/ The scientific production of the unit meets quality criteria.

Strengths and possibilities linked to the context

The quality of the scientific production of the unit is beyond doubt for all the thematic axes which have a majority of their publications in prestigious journals and/or in leading journals in the designed fields. Publications are related to the 4 different thematics that are developed in the unit during the period being 17 publications (24%) for "Molecular interactions", 26 (37%) for "Mechanics & signal transduction", 13 (28%) for "Cell migration & guidance", 26 (37%) for "Biophysical methods" and 14 (20%) for "Clinical transfer". It has to be noted that 25 publications relate to several thematics and are counted accordingly in the above statistics (i.e 96 versus 71 publications). Each thematic is publishing in prestigious journals (e.g. 2 *Nature* as collaborators, 2 *Nature Physics* including one as first/corresponding author, 3 *Nature communications* including one as first/corresponding author, 5 *PNAS* including 4 as first author and 3 as corresponding author) and/or in leading journals in the designed fields (e.g. 8 *Biophysical journal, Embo reports, Optics letters*, 2 *ACS Nano*, 3 *Nano Letters*).

Weaknesses and risks linked to the context

The provided scientific production includes 2 publications from one new comer (corresponding author for both). The potential departure of 2.5 eq. researchers may impact the scientific production.

2/ Scientific production is proportionate to the research potential of the unit and shared out between its personnel.

Strengths and possibilities linked to the context

The LAI's scientific production is excellent with 71 articles, 2 books and 3 book chapters for 7.33 full-time equivalents / researchers during the period. The production rate is up by 10% compared to the previous period. 50% of the scientific publications have LAI researchers as main investigator and/or LAI PhD student as 1st author. 62.5% of the scientific publications is related to the work of PhD students (10 defended their PhD during the period) and 32% for the post-doctoral students (15) which correspond approximately to 4.5 ACL/ETP doctoral students/year and 1.5 ACL/ETP post-doctoral students/year during the period. Quality of articles seems to be favoured over quantity. The practice of the lab is to associate its ITAs to its publications.

Weaknesses and risks linked to the context

The production of the post-doctoral students is less than one paper/year (their average stay is around 2 years). Albeit the proven collaborations between researchers in the lab, only 15% of the scientific production is related to internal collaborations between the 2 sites of LAI (Timone and Luminy).

3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science.

Strengths and possibilities linked to the context

To the best of our knowledge and based on the discussions during the zoom meeting, the unit respects well the rules requested for open science practices. The presence of a technical platform contributes to the traceability of results by improving the availability of information and therefore to the principles of scientific integrity. The unit shares 6 technical staff to manage platforms mutualized with 4 Inserm units of TPR2 building; this includes 2 agents for the animal facility. In the coming months, the unit will implement a local server system to back-up important information and link the saved data to their experimental metadata for data processing, further reuse and/or sharing with colleagues. All papers are deposited on HAL, preprints are deposited on bioRXiV or arXiv and codes are shared on GitHub / GitLab.

Weaknesses and risks linked to the context

There is no detected weakness and risk linked to the context.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The LAI has excellent non-academic medical and industrial interactions.

1/ The unit stands out by the quality of its non-academic interactions.

Strengths and possibilities linked to the context

Proximity with the hospital allows access to patient material and accelerates the development of prototypes for a potential later medical transfer. It also allows obtaining specific grants and support from the Institutions. In respect to its medical activity, LAI shares lab space and human resources with the hospital La Timone, with the goal to perform medical transfer. An LAI patent is routinely used for diagnosis in the service of Immunology of Marseille University Hospitals, and a set-up to combine assessment of adhesion and migration properties of immune cells is being tested with patients. The LAI obtained several innovation grants from the Regional Council and the Hospital of Marseille.
The unit obtained 2 pre-maturation grants from CNRS, and 1 maturation grant from SATT Sud-Est. Collaborations are at different levels and concern technological transfer of innovative techniques based on expertise and patents of LAI, co-developments and beta testing of new instruments.

Weaknesses and risks linked to the context

No weakness detected.

2/ The unit develops products for the socio-economic world.

Strengths and possibilities linked to the context

Overall, the LAI has excellent medical and industrial activities. The LAI has 1 active medical project for diagnostics and 2 industrial collaborations with potential commercialization: one with Nanolane, and one with Idylle (total 96k€). Both concern innovative substrates developed at the LAI. It is also mentioned that a new patent is under consideration that uses the Alveole technology, for which Alveole is not involved in the IP.
Industrial collaborations allow to connect LAI with the industrial world, access to new technologies, and possibly to transfer their innovations to the industry.

1 patent was issued during the evaluation period and 2 have been prepared for deposition in 2022. 1 product was released on the market in 2021 with the company Idylle (https://www.idylle-labs.com/chitozen).

The exposure of LAI's students and post-docs to problems of the academic and industrial world alike, constitutes an excellent training and preparation for them to join companies. This training contributes to and strengthens the links between both worlds in respect to technical development and human resources.

Weaknesses and risks linked to the context

Industrialization is time and resource consuming. One threat is to spend lot of time without reaching / generating commercialized products with revenue. It seems that despite all the industrial activity, no product has yet generated revenue. As of now, the unit does not seem to have the resources and know-how to bring a diagnostic tool to the market.

3/ The unit shares its knowledge with the general public and takes part in debates in society.

Strengths and possibilities linked to the context

The unit participates to public events such as "Nuit des chercheurs" and "Fête de la science", and has participated to the organization of "13 minutes Marseille", "Ma Thèse en 180s",
1 PhD student is currently part of the Scientific culture cell Research and Development Department of AMU.
Members of the unit are involved in science popularization towards pupils in the framework of the association “Tous Chercheurs” and “Declics”.
Some members contribute to podpasts and are active to social media.

Weaknesses and risks linked to the contextt

The main weakness is the management of the website and communication.

C - RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, resources and organisation of the unit

LAI needs to be attentive in respect to the important flux of researchers over the last years in order to maintain a critical size, avoid loss of knowhow and ensure attraction of new skills. The acquisition of a server for the unit seems absolutely required to ensure proper data storage and internal accessibility.

Recommendations regarding the Evaluation Area 2: Attractiveness

LAI is encouraged to increase its international visibility by all means, and in particularly by improving its website and enhancing communication, in order to facilitate attraction of statutory researchers, international personnel and students as well as international scholars. Theses in co-direction or co-supervision should be considered.
LAI is encouraged to continue and increase its active role in European and International Research consortia and collaborations. More unit members should be implied in the organisation of conferences and membership to scholar's societies.

Recommendations regarding Evaluation Area 3: Scientific Production

LAI should be attentive to make sure that post-doctoral fellow contracts are sufficient in duration to allow good publication rates and to ensure efficient internal collaboration between the staff present at Timone and Luminy.
LAI is encouraged in its effort to develop diagnostic tools, but also to bring them to the market. The website of LAI should be improved to increase the visibility of LAI.

Recommendations regarding Evaluation Area 4: Contribution of Research Activities to Society

The panel strongly encourages the LAI to pursue its effort in the transnational activity they are engaged in. Every occasion of exposing staff to industrial problems should be exploited. The panel also encourages the LAI to push forward some of their diagnostic tests to the market albeit the complexity of the task.

CONDUCT OF THE INTERVIEWS

Date

Start: 01 December 2022 at 08:00

End: 01 December 2022 at 18:00

Interview conducted: online

INTERVIEW SCHEDULE

8:55-9:00	Hcéres Rules and procedures by B. Bartosch Public Session (all unit members)
9:00-10:40	Administrative and Scientific presentations of the Unit 15' presentation of the Unit (O Theodoly) 10' presentation of axis 'Molecular interactions' (C Valotteau) 10' presentation of axis 'Cell interactions' (L Limozin) 10' presentation of axis 'Cell migration & Guidance' (MP Valignat) 10' presentation of axis 'Medical transfer' (P Robert) 45' Questions Public Session (all unit members)
10:40-11:00	Hcéres committee debriefing (closed-door meeting)
11:00-11:30	Meeting with ITAs (in French) In the absence of any managing staff
11:30-11:50	Meeting with researchers In the absence of any managing staff
11:50-12:10	Meeting with post-docs and students In the absence of any managing staff
13:15-13:45	Meeting with Institution Representatives: (AMU, CNRS, Inserm)
13:45-14:30	Meeting with the Management Team of the Unit (closed-door meeting)
14:30-18:00	Redaction of the final report (closed-door meeting)

GENERAL OBSERVATIONS OF THE SUPERVISORS

Le Président de l'université

au

Département d'Évaluation de la recherche - Hcéres

Objet : Observations de l'unité relatives au rapport d'évaluation des experts Hcéres
N/Réf. : VPR/LS/AMS/CM – 23-06

Dossier suivi par : Cécile Merle
Tél : 04 13 94 95 90
cecile.merle@univ-amu.fr

Vos réf : DER-PUR230023210 - LAI - Laboratoire adhésion et inflammation

Marseille, le mercredi 21 juin 2023

Madame, Monsieur,

Je fais suite à votre mail du 22/05/2023 dans lequel vous me communiquiez le rapport d'évaluation Hcéres de l'Unité de Recherche LAI - Laboratoire adhésion et inflammation.

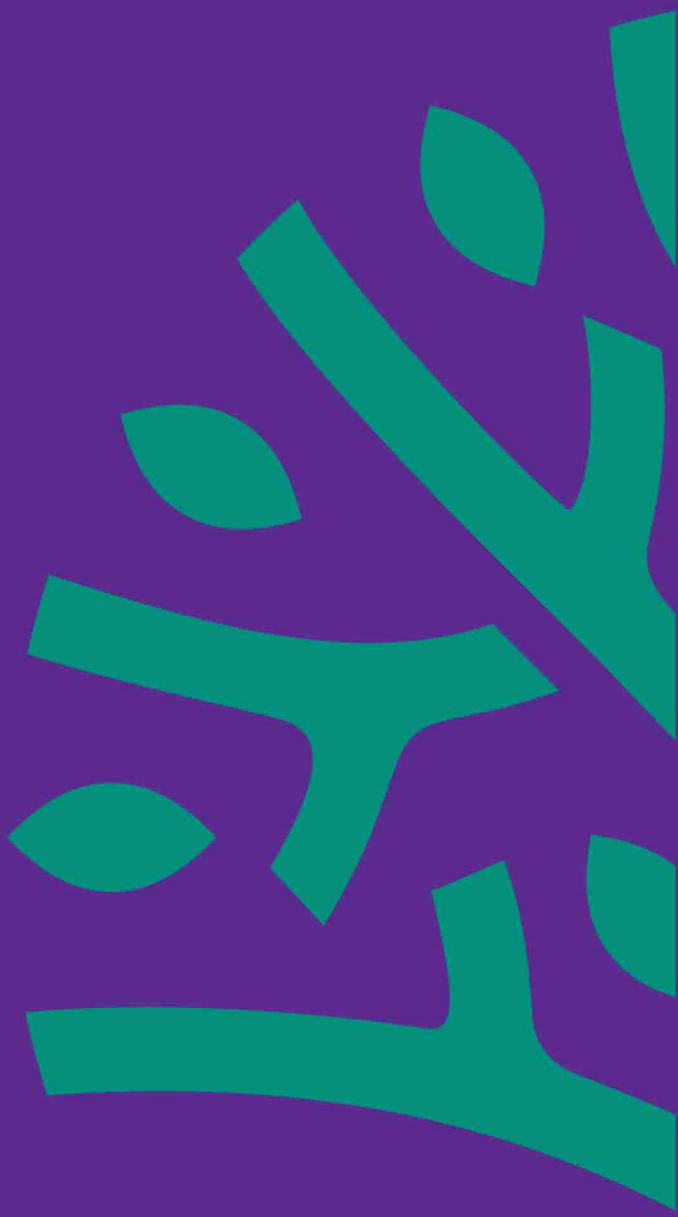
Comme demandé dans ledit mail, je vous indique que les tutelles du LAI, Aix-Marseille Université, l'Inserm et le CNRS, n'ont pas d'observation à formuler.

Vous souhaitant bonne réception des présentes,

Je vous prie de croire, Madame, Monsieur, l'expression de mes respectueuses salutations.

Eric BERTON

The Hcéres' evaluation reports are available online:
www.hceres.fr
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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