

EVALUATION REPORT OF THE UNIT
I2CT - Immunology, Immunopathology and
Therapeutic Chemistry

UNDER THE SUPERVISION OF THE
FOLLOWING ESTABLISHMENTS AND
ORGANISMS:

Université de Strasbourg

Centre national de la recherche scientifique -
CNRS

EVALUATION CAMPAIGN 2022-2023
GROUP C

Report published on July, 07 2023



In the name of the expert committee¹ :

Stefano Casola, Chairman of the committee

For the Hcéres² :

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 Stefano Casola, The FIRC Institute of Molecular Oncology, Italy
	Ms Anne Bordron-Loussouarn, Université de Bretagne Occidentale, Brest (representative of CNU)
Experts:	Mr Stéphane Mélik Parsadaniantz, CNRS, Paris (representative of CoNRS)
	Ms Sophie Novault, Institut Pasteur, Paris (supporting personnel)
	Ms Ling Peng, CNRS, Marseille
	Mr Peter Van Endert, Université Paris Descartes

HCÉRES REPRESENTATIVE

Ms Anne-Marie Di Guilmi

CHARACTERISATION OF THE UNIT

- Name: Immunology, Immunopathology and Therapeutic Chemistry
- Acronym: I2CT
- Label and number: UPR3572 CNRS
- Number of teams: 4
- Composition of the executive team: Ms H el ene Dumortier

SCIENTIFIC PANELS OF THE UNIT

SVE4: Immunity, Infection and immunotherapy

ST4: Chemistry

SVE6: Human Physiology and Physiopathology, Ageing

SVE7: Prevention, Diagnosis and Treatment of Human Diseases

THEMES OF THE UNIT

UPR3572 "Immunology, Immunopathology and Therapeutic Chemistry (I2CT)" is a pluri-thematic unit consisting of 59 units of personnel, of which 19 hold permanent positions (distributed among professors, lecturers, senior scientists, scientists and research-supporting personnel).

The unit is focused on studying different aspects of the physiopathology of the immune system combining clinical investigations with work in preclinical models and human skin explants. The pathogenesis of autoimmune disorders, as well as investigations on molecular determinants shaping immune cell-associated niches in secondary lymphoid tissues and skin (the latter achieved through advanced tissue engineering), represent major focuses of the unit's research activities. Another major interest of I2CT is concentrated around the development of carbon-based nanomaterials for biomedical applications.

For the next contract the unit will consist of three teams structured around research activities which will continue to address the pathogenesis of autoimmune disorders and invest in advanced methods of tissue engineering and functionalized nanomaterials for clinical applications.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The CNRS research unit UPR3572, named "Immunology, Immunopathology and Therapeutic Chemistry" (Immunologie, immunopathologie et chimie th erapeutique (I2CT) - UPR3572, acronym I2CT) is hosted in the Institute of Molecular and Cellular Biology (IBMC), in Strasbourg. It was created in 2013 and since 2018, I2CT is directed by Dr H el ene Dumortier, with Dr Alberto Bianco acting as Deputy Director. The I2CT unit is composed of 5 teams in the period 2016-2017, 4 from January 2018 till November 2019, then 3 teams. By the end 2021, I2CT is represented by 38 units of personnel, including 15 permanent staff members.

RESEARCH ENVIRONMENT OF THE UNIT

I2CT is a CNRS research unit hosted within the Institute of Molecular and Cellular Biology (IBMC) placed on the main campus of the Esplanade in Strasbourg. It shares the location with unit UPR9022 focused on insect models of innate immunity and unit UPR9002 interested in RNA biology. Research Federation FR1589 provides I2CT members with administrative support, and IT support, as well as technological platforms such as proteomics.

The I2CT unit is involved in several structures linked to the Programmes d'investissements d'avenir (P.I.A.) including:

- 1) Labex Medalis: created in 2011 by the former unit director and since 2021 converted into the "Research" axis of the Strasbourg Institute of Medicine to which Team 2 is affiliated.
- 2) Labex Chemistry of Complex Systems: currently the Interdisciplinary Thematic Institute (ITI) of which the head of Team 4 is a member of the executive committee since 2020.
- 3) EquipEx I2MC: allowing the establishment within IBMC of a technological platform including a LSB3 insectarium and specific pathogen-free experimental areas.
- 4) PACIFIC Institute project to which Team 3 is affiliated as head of the Rheumatology department and coordinator of clinical research and trials.
- 5) The head of team 4 is member of the International Center for Frontier Research in Chemistry (CIRFC), which supports the internationally recognized Strasbourg cluster of excellence in chemistry.

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

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	3
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	8
Subtotal permanent personnel in active employment	15
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	4
PhD Students	18
Subtotal non-permanent personnel	23
Total	38

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

Employer	EC	C	PAR
CNRS	0	6	8
Université de Strasbourg	0	0	0
CHU Strasbourg	1	0	0
Others	0	0	0
Total	1	6	9

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	757
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)	461
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	4 111
Own resources obtained from international call for projects (total over 6 years of sums obtained)	4 372
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	219
Total in euros (k€)	9 920

GLOBAL ASSESSMENT

The global assessment of the I2CT unit is **excellent**.

The I2CT unit is now composed of 3 teams that are working on the interactions of the immune system with its micro-environment, auto-immune responses and 2D materials for therapeutic purposes. These scientific themes are at the interface between basic fundamental research and a more technologically orientated axe which ensures the development of innovative tools for chemistry and immunology. This interdisciplinary is an asset and is part of scientific strategy 'from benchside to bedside'.

The I2CT unit presents a well-balanced distribution in staff composition among its three teams. The unit shares a robust core of instrumentations (several risking yet to be soon outdated) which allow advanced cell imaging, flow cytometric single cell analysis/purification and peptide synthesis, together with an insectarium, ensuring high-end fundamental and pre-clinical research. The scientific objectives of I2CT are in line with national and local research priorities, often in the frame of excellence initiatives, with societal impact waiting for first achievements.

Working time, mission, medical prevention and safety of the unit's personnel follows the recommendations of the CNRS/university authorities. The unit is actively engaged in implementing measures to protect the environment and has elaborated a business continuity plan to ensure long-term conservation of biological reagents including cell lines and preclinical models.

Over the years, the unit has acquired strong national and international scientific visibility and secured substantial national and international funding, yet suffering from limited attractiveness towards the recruitment of highly-promising junior researchers and the hosting of internationally recognized visiting scientists. The overall scientific production of the unit is original and of high quality with some imbalance between the teams. The unit complies with rules and regulation that respect human beings and experimental models and is attentive to standards of research integrity.

The unit has established strong partnerships with hospitals. Relations with industries and non-academic actors await the valorisation through the filing of patents of at least some of the several original contributions recently made by the teams of the unit. I2CT is actively engaged in scientific outreach activities and in the organization of events for the general public.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

1. Publication in higher impact journals

In the period 2016-2021 I2CT has succeeded to publish research articles in high-impact journals, mostly related to the research field of interest, including Advanced Materials, Immunity, Science Immunology and Nature Communications. The collaboration with internationally-recognized laboratories, especially in the field of immunology has contributed to increase the quality of the publication record of I2CT team members. The overall quality of the publication list of the unit is improved as witnessed by the appearance of research articles authored by unit members in journals belonging to high profile journals.

2. Recruitment of international post-doctoral fellows

More than 50% (14/22) of the post-doctoral fellows hired during the period 2016-2021 by I2CT Teams are foreigners.

3. Internal communication and authorship policy

Social activities outside the laboratories were encouraged to strengthen the relationships among unit members. Except for one technician, all I2CT engineers and technicians have been included in the list of authors of publications produced by the unit.

4. Training activity

Most researchers (including post-doctoral fellows and graduate students) and engineers teach and train at different levels at the University of Strasbourg or University of Haute-Alsace.

5. Prioritization of projects

The contraction of the size of the I2CT has coincided with an expected reduction in the number of research projects run by the teams. In some instances, projects were cut due to high competition, or naturally ended. Repositioning and focusing of team 2 projects towards tissue engineering, together with exploitation of well-established chemical approaches for the development of carbon nanomaterials and 2D materials (team 4) have contributed to the prioritization of research lines conducted within the I2CT unit.

B – EVALUATION AREAS

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

Assessment on the unit's resources

Overall the resources of the unit are very good to excellent.

The staff composition and its well-balanced distribution between the three teams now composing the unit, and the shared support activities are well adapted to the research ambition extending from very fundamental to preclinical research.

The unit is very successful in acquiring third party funding from national and international resources which complement the minor financial support from CNRS and University.

The unit has globally sufficient space and access to close-by state-of-the-art core facilities and to collaborating teams.

Assessment on the scientific objectives of the unit

Overall the scientific objectives of the unit are excellent.

The scientific objectives of the unit are very well in agreement with the state of the art in the respective fields of research of the different teams and with national and local research priorities and excellence initiatives. Although the unit has not been able to exploit its results and their societal impact so far, the overall scientific objectives of the unit are excellent.

Assessment on the functioning of the unit

Overall the functioning of the unit is excellent.

The functioning of the unit follows the recommendations of the CNRS/university authorities in terms of the organization of working time, missions, medical prevention and the safety of their personnel. The unit pays particular attention to the protection of the environment by ensuring the sorting of its waste, but also in terms of saving electricity. In addition, a Business Continuity Plan has been put in place concerning the conservation of cell lines as well as experimental models.

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

Strengths and possibilities linked to the context

Following the departure of the team led mainly by clinicians, the unit's composition is adapted to a research ambition extending from the very fundamental to the preclinical. Two teams now composing the unit has two tenured scientists and one engineer, team 3 has 3 tenured researchers (2 PhD and 1 MD-PhD) next to multiple PhD students. This staff assigned to teams is complemented by technicians and engineers dedicated to experimental core facilities, image analysis peptide synthesis and an administrative manager. The unit indicates a need of an additional engineer for microscopy and image analysis, a request of a new position has not been successful so far. An additional university researcher could be recruited in 2023 and should join team 3. The unit wishes to recruit an additional team as well as tenured researchers to the existing teams. Candidates have already been identified.

The funding of the unit by the CNRS and the University of Strasbourg (not counting salaries of tenured staff) is very limited (757 k€ over 6 years). However, the unit has been consistently successful in national and international calls for projects, having obtained > 500 k€ and up to 1000 k€ from each source in most years. This

notwithstanding, one notes some imbalance in funding, with excellent success for team 4, intermediate success for teams 1 and 2 and more limited success for team 3.

The unit has recently decided to install a levy of 20% on non-salary amounts obtained through grants, this resulting budget being only used for standard laboratory and office consumables shared by all teams. A budget for collective research activities or initiating novel themes is not available.

The previous team 1 having left the unit at the end of 2019 to join the unit Inserm U1109 in Strasbourg, the office and laboratory space is now considered sufficient. The unit interacts with a dynamic research campus and has access to state-of-the-art core facilities. It can also obtain samples from patients with autoimmune pathologies through clinicians working in the unit.

Weaknesses and risks linked to the context

The use of the 20% levy on contracts for common standard material limits the possibilities of the unit to develop innovative and/or collective research themes and to set up replacement of aging equipment. In this context, the research program of team 3 could be curtailed by its limiting financial resources. A budget for collective research activities or initiating novel themes is not available.

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

Strengths and possibilities linked to the context

The unit defines its objectives with respect to two thematic sections of CNRS (INSB section 28, INC section 16), with a global strong technological orientation. Furthermore, it is linked to the local University and its hospital. It participates in several local structures funded by the national Excellence investment initiative.

The recognition of the team documented by funding acquisition, invitations of its members and publications provides evidence that the research carried out in the unit is relevant with regards to the state of the art in the respective fields of research, and that unit scientists exchange with the main academic players involved.

Involvement of unit scientists in multiple local structures created by the national excellence initiative (PIA), an Institute for personalized medicine (PACIFIC) and a highly recognized International Centre for Frontier Research in Chemistry (CIRFC) is testimony of the adaptation of the unit to the policy of national and local supervisory authorities.

Weaknesses and risks linked to the context

Significant efforts for economical exploitation of research results cannot be identified so far. The unit envisages potential societal impacts of its research however concrete steps to implement this have not been taken so far.

While engineers and tenured researchers are encouraged to participate in research initiatives and free to choose projects, there does not seem to be any structured and regular mechanism designed to involve the different categories of staff in research policy and exploitation.

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 internal regulations cover the organization of working time as well as absences, missions, prevention and security, data processing and confidentiality as well as the security of information systems (ISS).

In accordance with the action plan for professional equality set up by the CNRS (2021-2023), the unit has recently assigned an equality advisor, and this research unit is composed approximately by 55% female and 45% male (and 50/50 when considering managing of the teams). The recruitment is based on the knowledge and skills of candidates. A special attention is paid by the staff for the career development of Engineers-Technicians (IT). Two prevention assistants for chemistry and biology were renewed in 2018: their mission includes training newcomers on safety, monitoring annual exposure sheets, and drafting and updating the unit's occupational risk assessment document. A Committee on Health, Safety and Working Conditions is in place within the IBMC,

composed of representatives of the 3 units and the FR. In addition, the CNRS or university medical services provide for a mandatory medical examination for newcomers, and team members.

The management of the Institute's network is under the responsibility of an engineer from FR and the informatic correspondent of the unit. The unit internal network is protected by a firewall, and secure VPN for external connection. The unit has a data storage server to store their scientific data as well as a secure university or CNRS cloud. Both permanent and non-permanent staff have an encrypted computer. As the electronic laboratory notebook has not yet been deployed by the CNRS, an official paper notebook is used with numbered pages and signed by the user and countersigned by the supervisor.

Two Sustainable Development referents belonging to UPR9002 and 9022 respectively have been appointed to the Institute in 2021. A first assessment of the IBMC's greenhouse gas emissions was carried out in 2019 and was estimated at 350,000 kg of CO₂: 43% are related to buildings (heating, electricity) and 57% to travel (missions or work from home). In addition, with regard to the economy of electricity, the lights and computers are turning off in the evenings and on weekends.

Waste paper and cardboard are disposed of separately for recycling. Chemical and biological wastes are disposed through specific channels.

The unit was led to evaluate its Business Continuity Plan (BCP) during emergency situations, particularly following the Covid-19 pandemic. Two major elements have been thus identified: 1) maintaining the liquid nitrogen level of cryopreserved cell containers, 2) monitoring the proper functioning of freezers and refrigerators containing all reagents.

Weaknesses and risks linked to the context

No risk linked to the context have been identified.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractiveness of the unit is very good to excellent.

The unit has very good national, European and international visibility. The unit has limited success in attracting and recruiting junior researchers and hosting renowned visiting scientist visitors. The unit is globally very successful in attracting national and international funding. The unit owns several major technical equipment but has difficulties in renewing some of them.

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

The unit has an interesting attractiveness at the national level but also beyond and thus at the European level. In fact, the teams are very involved in the management of various national (GDR management, member of section 28 of the CNRS National Committee) and international (member of the executive committee of the Graphene Flagship organisation). We find this investment in scientific expertises (Observatory of Micro and Nanotechnologies, Scientific Advisory Board of Inserm; SPIRIT commission of SNSF, Switzerland; expert committee of the "Xi'an Huaqing Haikang Graphene Institute of Medicine and Healthcare", China). The researchers of the unit are also in charge of the evaluation of funding requests in the framework of calls for projects (ex: ANR, various associations/foundations such as Arthritis Courtin, ARSEP). Researchers are involved in various learned societies (Club Rhumatismes et Inflammations, Société Française de Rhumatologie). They are members of editorial committees or reviewers (Frontiers in Immunology - Autoimmune and Autoinflammatory Disorders, Frontiers in Immunology, Nanomaterials, Crabon). As expected, they are members of thesis and HDR juries. They are also invited to numerous conferences and organize a certain number of them, always at the national and international level (CNBMT19, Tenth Symposium on Carbon Nanomaterial Biology, Medicine and Toxicology, 1st European Conference on Chemistry of Two-Dimensional Materials, International Conference on Autoimmunity). The clinicians of the Unit are in charge of cohorts, clinical trials (CORIMUNO-19 : Cohort Multiple randomized controlled trials open-label of immune modulatory drugs and other treatments in COVID-19, PRO-SPIRIT : Psoriatic

Arthritis Observational Study of Persistence of Treatment) and participate in the drafting of European recommendations for the management of patients (Recommandations européennes concernant la prise en charge du syndrome de Gougerot; de la polyarthrite rhumatoïde; Recommandation européenne concernant l'autorisation d'enregistrement du graphène par l'ECHA Agence Européenne des produits chimiques, selon les lignes directrices de l'OCDE). Some awards and distinctions obtained confirm the visibility of the unit (Médaille d'Argent CNRS, Membre élu de l'Académie européenne des sciences, Prix de l'innovation de la Fondation Arthritis).

Weaknesses and risks linked to the context

However, this attractiveness must be maintained and even developed. This must be done through additional permanent recruitments and the possibility of expanding in terms of premises and being able to renew certain equipment: flow cytometry (note that the cell sorter is new), spinning disk confocal microscope, peptide synthesizer. This can also involve more collaboration between the unit's teams and thus enable the various requests made to be reinforced.

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

Strengths and possibilities linked to the context

The unit is very involved in the reception of many master M1 and M2 students (59 during the period 2016-2021, from Strasbourg and outside), PhD students (45 during the period 2016-2021). Post-doctoral fellows have been welcomed in the unit, 22 during the period 2016-2021, 16 from abroad. All researchers give lectures at the Strasbourg University in Immunology and Nanomaterial Chemistry, which allows to make their disciplines known and attract students for Masters internships. A partnership of Team 4 with China allows the recruitment of Chinese PhD students, 6 were present in May 2022. The unit indicates that a significant amount of support is provided to Master 2 students, in particular for their preparation for the doctoral entrance exam conducted by the doctoral school. A success rate of 90% is obtained at the Ecole Doctorale Vie et Santé competition which contributes to the attractiveness of young researchers. The latter are associated with publications according to their role in the research undertaken.

The unit welcomes visiting researchers, 4 Japanese professors during the period 2016-2021).

Weaknesses and risks linked to the context

Three young researchers have taken part in competitive CNRS entrance examinations but this has not been successful for the moment.

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

The unit has a strong record in raising fundings. At the international levels, 2 grants were obtained from IRP (France-Singapore partnership). Eleven European contracts were raised, including several related to the Graphene Flagship as well as the EURIdoc program ("Eucor Upper Rhine Immunology doctoral program" between France, Germany and Switzerland). At the national level, 7 contracts were financed by the ANR, including 2 for the creation of networks, 7 contracts financed by Labex/Idex and 9 contracts financed by associations/foundations. These own resources obtained over the period 2016-2021 have made possible to finance 11 PhD students, 17 post-doctoral and 3 engineers positions.

Weaknesses and risks linked to the context

The main difficulty will lie in maintaining these good results over time.

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

Strengths and possibilities linked to the context

The unit has set up major technological skills, essential for its own activity and which participate to its attractiveness. The flow cytometry equipment pool is one example, among which a recently purchased cell sorter machine that allows to sort four different cell populations at the same time. The imaging platform is in full expansion. It is equipped by devices devoted to a wide range of applications: from tissue cryo-section to single cell analysis (in fixed and live conditions) by confocal/spinning disk fluorescence microscope. The 4D data obtained on this microscopy platform are analysed by performant image analysis software like Imaris. Finally, the peptide synthesis platform generates important collaborations and publications in addition to the unit internal use.

It should be noted that each of this platform has dedicated personnel. To note, a will of labelling and the installation of identification of the costs having to lead to invoicing for the various users, particularly those outside the unit.

Weaknesses and risks linked to the context

Some equipment is aging and needs to be replaced (see above). Different strategies are proposed and must be implemented so that this equipment does not become obsolete.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The scientific production of the unit is globally excellent.

The scientific production of the unit is original and of high quality. All the members contribute to the scientific production although there is some imbalance between the teams.

The unit complies with rules and regulation that respect human beings and experimental models and is attentive to standards of research integrity.

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

Strengths and possibilities linked to the context

Team 1 focuses its research on the study of the mechanisms of B and T cell homeostasis, more particularly on the disruption of tolerance leading to the development of autoimmune diseases such as Systemic Lupus Erythematosus (SLE), antiphospholipid syndrome and systemic scleroderma, and during primary immune deficiencies. For this purpose, several models (cell lines, genetically modified models) were developed. In addition, a part of the research is done on patient samples. In addition, the team is interested in the role of autophagy machinery in these contexts. Between 2016 and the end of 2019, Team 1 produced 96 papers, including 18 experimental papers, 15 reviews and 53 clinical publications.

The team 2's publications are clearly original and make a sound contribution to knowledge. Indeed, the team has highlighted for the first time the dialogue between mesenchymal cells and lymphatic endothelial cells, particularly in the lymph node which creates a niche for immune cells. Team 2 also explored molecular mechanisms and demonstrated that cellular communication is mediated by members of the TNF super family, (RANK-RANKL). The team recently demonstrated interindividual variability in the control of allergic responses by human epidermal cells. These results are based on the study of many different models using well-established experimental methods. The team set up methods to build a highly physiological 3D model of human skin with nociceptive innervation and immunocompetent cells. To conclude, the level and number of publications must be at least maintained and even developed.

Team 3 develops projects ranging from the fundamental to the clinical, mainly in the field of two systemic autoimmune diseases, lupus and Sjögren's syndrome. Team 3 collaborates with the chemists of Team 4, to explore new methods of targeted administration based on the use of functionalized carbon nanoparticles. The

team is particularly interested in the bio/immunocompatibility and the ability of carbon nanoparticles to target immune cells of interest in order to modulate or eliminate them in autoimmune diseases. The identification of a compromised inhibitory function of BTLA4 in helper T lymphocytes of lupus patients, published in *JCI Insight*, has been a scientific highlight of the team in the last years.

Team 4 is working actively in carbon materials for biomedical applications. This Team has an outstanding publication records in both quality and quantity. It has 100 publications in high level international interdisciplinary journals such as *Nature Communications*, *Angewandte Chemie*, *Advanced Materials*, *Advanced Functional Materials*, *ACS Nano*, *Small*, *Nanoscale*, *Carbon*, etc. Also, all publications are also available in the HAL-CNRS (<https://hal-cnrs.archives-ouvertes.fr/>) and UnivOAK (<https://univoak.eu/>) archives.

Weaknesses and risks linked to the context

Teams 1 and 3 both published papers in journals of very good to excellent quality though and should try to target journal of the highest international level.

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

In general, the unit has a very good publication record.

Team 1 was composed of 6 scientists (5 with tenured positions) with clinical or diagnostic next to research tasks, together with two engineers and 6 doctoral students. The team produced 96 articles including 18 describing experimental work and 53 clinical publications; all tenured scientists contributed to the publications and all doctoral students signed at least 3 publications. Overall the production of team 1 was adequate to its potential.

Between 2017 and 2021, Team 2 published 14 original scientific articles, 6 reviews and 4 book chapters. Team 2 researchers sign original scientific papers in the first position and as last author/corresponding author showing a dynamic publication activity. PhD students and post-docs also participate in publications and present their work (orally and by poster) at several national and international congresses. Team 2 members collaborated with an internationally renowned group and co-published their work. Indeed, the work published in *Immunity* includes 10 other authors from 3 other high-level laboratories in Switzerland and Japan. The study published in *Acta Biomaterialia* on a 3D model of human skin is a collaborative work with a Canadian laboratory.

Team 3 is composed of two tenured full-time CNRS researchers and several clinician-scientist. With 31 experimental articles and 82 clinical articles, the production of the team was excellent. Among the experimental articles, one was published in a high quality journal (*JCI Insight*). However, production of articles was somewhat unbalanced in favor of articles by the clinicians. Only one of the two full-time scientists signed experimental articles as senior author.

Team 4 has only 2 permanent researchers, but it had an average of about ten PhD students and postdocs per year in the period 2016-2021, which allowed a high quality and quantity scientific production: 100 articles in high-profile journals and 7 book chapters. All PhD students and post-docs contributed to the scientific production either as articles or book chapters. The majority of the publications have an interdisciplinary character, chemistry and immuno-oncology.

Weaknesses and risks linked to the context

With participation of all senior and junior scientific staff of team 1 being implicated in publications and presentations, no weakness is identified for this team. If team 2 has a good level of publications, it would be interesting if the members were more in rank in the publications.

Concerning team 3, full-time scientists benefit of few invitations from other institutions, to congress presentations and to submission or editorial organizing of reviews. The team has limited success in acquiring funding from national sources and has not obtained international funding. The number of first author publications signed by PhD students trained in the team is limited.

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

The scientific production respects the rules and values guaranteeing honesty and scientific rigor but also human beings and experimental models. The unit is attentive to the principles of open science by sharing publications, particularly via the BioRxiv platform. All publications are available online in the HAL-CNRS (<https://hal-cnrs.archives-ouvertes.fr/>) and UnivOAK (<https://univoak.eu/>) archives.

Weaknesses and risks linked to the context

No weaknesses is identified.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The inclusion of the unit's research in society is very good to excellent.

The unit has established partnerships with hospitals and non-academic actors. Although interactions with industries are well identified, the filling of patent applications and valorisation of unit results remain to be developed. The unit is actively engaged in scientific outreach activities and in the organization of events for the general public.

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

Strengths and possibilities linked to the context

The unit is active and demonstrate its willingness to integrate its research activities into society, though interactions with association patients, hospitals (participation to several clinical research projects), european projects (Rarenet, Graphene, Flagship, RADDEL, DIAGONAL) and writing recommendations for European Agency. Team 1 has developed collaborative links with Sanofi that resulted in the hosting of one Sanofi employee for one year and dispensing classes on immunology to other Sanofi employees. The team also obtained funding for one PhD student through collaboration with an Arthritis Foundation. Team 2 is regularly invited to innovation forums (KURT Innovation Day) to exchange about skin organoids processes. Team 4 exchanges with consumer associations and local social organizations about risks / benefits of nanoparticles.

Weaknesses and risks linked to the context

Interactions and collaborative studies in association with hospitals might be maintained and/or reinforced especially after the departure of Team 1.

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

Strengths and possibilities linked to the context

As a general comment at the unit level, it is noted that numbers of partnership interactions with industries have been established (SANOFI, Amgen, MedImmune, Advanced Science Solutions, Cifre contract, EURIdoc program). One member of the unit is in charge of the paternship and valorization of the unit. The development of innovative tools (nanoparticles; immunocompetent skin organoids) are of interest to industrialists and open the way to future applications (therapeutic strategies, tests of molecules) with a certain medical and economic interest. Team 2 has established a partnership with the company Advanced Science Solutions in Life Sciences in the field of vascularization of reconstructed tissues. It hosted a student on a Cifre contract and participates in the EURIdoc doctoral program, a partner of the Rhine transfer agency (KTUR). Team 3 has been also very active in developing links with pharmaceutical companies. Two of these exploited the technical and scientific know-how of the team (contracts with Medimmune and Amgen), while others were linked to the clinical activity of the team rheumatologists (partnerships with Bristol Myers Squibb, Pfizer and Lilly). The team also obtained support

for a project concerning plant-derived virus-like particles as vaccines. Team 4 is recognized in France and internationally for its interdisciplinary work on the chemistry of carbon-based nanomaterials and their biomedical applications (therapeutics, imaging etc). The team has developed collaborative projects with industrial partners at the European level (Flaship Graphene, RADDEL, DIAGONAL) and is involved in the studies on health impact and biomedical applications of graphene in link with industrial and medical applications. Team 4 has a global proactive approach to valorize its research, protect intellectual property and file patents. The team is in discussion with the SATT Conectus Alsace to evaluate the patentability of new hydrogels products.

Weaknesses and risks linked to the context

Valorisation and IP should be more considered within the unit especially concerning the development of innovative tools such as multifunctional particles (Team 4) or innervated and immunocompetent skin organoids (Team 2).

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 is actively involved in public outreach through local scientific events, exchange with associations (e.g. journées internationales maladies rares), interviews in social media, presentations on benefits & risks of nanoparticules, (fête de la science, collège, lycée, médiathèque.), TV programs to present organoids applications.

Weaknesses and risks linked to the context

The unit does not have a major weakness in this field.

C – RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, Resources and Organisation of the Unit

The committee considered that the strong diversification of the topics studied in the teams and also to some extent within the teams limited the efficiency of research that could be ameliorated by stronger collaboration. The committee is aware that the merger with the other IBMC units will place the three I2CT unit teams in an environment with an even stronger diversification of topics but recommends to seek synergies and collaboration also in this future environment.

The committee considered that running the technical unit facilities (flow cytometry, imaging, peptide synthesis) and the replacement of both their staff and their equipment within the sole environment of the three unit teams may be challenging in the future. It encourages the unit to exploit the planned merger with the other IBMC units to strengthen the platforms, secure their staffing and obtain the replacement of aging equipment.

Following the discussion with the students and post-docs, the committee was concerned about the use of private laptops by students and postdocs for storage, analysis and processing of research data, which seems difficult to reconcile with rules of data security, confidentiality and intellectual property. The unit recommended to store and process all data on unit computers with access to CNRS servers (which is not granted to private laptops). The unit answered to this point that "data are not stored on private laptops, secured external hard drives are provided to all students and postdocs and they also have dedicated spaces on the secured unit server for that purpose".

Recommendations regarding the Evaluation Area 2: Attractiveness

The unit must continue to ensure its attractiveness by obtaining funding, efficient platforms and the recruitment of statutory staff, this can be further developed by increasing collaborations between teams.

Recommendations regarding Evaluation Area 3: Scientific Production

The unit must maintain its excellent level of publications. This publishing force might be further improved by stronger collaborations between the different teams of the unit and by strengthening their own external (national and international) collaborations.

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

The committee recommends setting up a policy of valorization and patentability of the technologies/products developed in the unit. This fantastic expertise should be valued and interactions with industry strengthened.

TEAM-BY-TEAM ASSESSMENT

Team 1: Lymphocytes Homeostasis and auto-immunity
 Name of the supervisor: Ms Pauline Soulas-Sprauel

THEMES OF THE TEAM

This team was part of the unit until October 2019 and was composed by 5 permanent teacher-scholars, with 4 of whom affiliated with medical or pharmacology departments. Correspondingly, the production of this team was strongly focused on research concerning medical conditions mediated by perturbation of B and T cell homeostasis, as well as on clinical research on autoimmune diseases and primary immune deficiencies. The team studied the breakdown of tolerance leading to the development of autoimmune diseases such as systemic lupus erythematosus, antiphospholipid syndrome and systemic sclerosis, and in the course of primary immune deficiencies, using different models and patient samples. The role of the autophagy machinery was also studied in these contexts.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

1-Funding of the team should be used to attract a full-time researcher to be stabilized in the coming years".

The team has not succeeded in recruiting a full-time researcher.

2-The expert committee recommends focusing on young MDs for PhD training. A true MD PhD program could be organized, since a bridge will come soon with the university as UMR with the CNRS."

An institutional MD PhD program has been implemented at the University level since 2013 and the team trained in research MD PhD students (seen as co-authors in clinical publications).

3-The expert committee recommends to maintain/increase the focus on models to human translation, having the two tracks in parallel. The expert committee recommends to define how the identified genes could be translated to the clinic, for instance as biomarker or treatment target for some subsets of SLE. Because of the large biocollection, the same tools could be used to better stratify SLE patients based on common clinical presentations (brain, kidney). The novel focus on B cell malignancies could make sense in the context of SLE. As discussed during the presentation, the focus on B CLL, without direct link with SLE, results from long-term research by a team member. The suggestion was made to include lymphoma, which is clearly more linked to the SLE / subglottic stenosis SGS context."

Since the team left the unit in October 2019, the committee did not go through these recommendations.

WORKFORCE OF THE TEAM IN PHYSICAL PERSONS AT 31/09/2019

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	1
Research supporting personnel (PAR)	2
Subtotal permanent personnel in active employment	8
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	0
Post-docs	2

PhD Students	0
Subtotal non-permanent personnel	3
Total	11

EVALUATION

Overall assessment of the team

Overall the performance of this team has been excellent.

With an output of 96 publications over 4 years, this team presents an excellent publication record, this despite the absence of full-time researcher members.

The team engaged collaborations with several leading teams in France, the US and Germany and the research was supported by 8 grants.

Two senior physicians in the team heading a clinical department and a reference center ensured a strong output in clinical publications.

The team trained 6 PhD students and is strongly involved in teaching at 4 local faculties.

Strengths and possibilities linked to the context

The attractiveness of this team is documented by invitations of its members, collaboration with leading teams, and its output in terms of publications. All tenured members of the unit gave presentations or invited talks during the period. The team collaborated with leading teams in France, Germany and in the US. Several of these collaborations had dedicated funding and most resulted in publications. The team also organized a yearly Franco-German meeting, funded by the Franco-German University and designed to train PhD students and young residents in immunopathology.

The team secured or was involved in two European grants, two ANR grants (one coordinated) and four foundation grants, resulting in overall annual financial support of between 200 and 458 k€.

The team published 18 experimental and 53 clinical papers among which papers in *Cell Death Diff.*, *JCI Insight*, *Autophagy*, and *J. Allergy and Clin. Immunol.* had team scientists as senior authors. To cite some key results of these papers, team members identified a mechanism by which a complex of autophagy-related proteins optimizes presentation of antigens internalized via the B cell receptor and were able to develop a new model of immunodeficiency combined with auto inflammation mediated by constitutively active STING.

Two senior physicians in the team head the department of Clinical Immunology and Internal Medicine at the University Hospital, and a National Reference Centre for Systemic Auto-immune Diseases. A great strength of this team was to benefit from clinicians who provide important help in obtaining human samples in different pathologies. All tenured lecturer-researcher members are implicated in teaching at different faculties including medicine, dentistry, pharmacology and life sciences.

The team has developed links with the Sanofi company that resulted in the hosting of one Sanofi employee for one year and in dispensing immunology classes to Sanofi employees. The team also obtained funding for one PhD student through collaboration with an Arthritis Foundation. Moreover, the team has worked with associations of patients concerned by immune deficits and participated in events designed to convey scientific issues to the general public.

Weaknesses and risks linked to the context

As noted in the previous evaluation campaign, being reinforced by a full-time scientist would have significantly enhanced the research potential of the team. However, with its present composition, the team has been able to produce and publish results in mechanistic studies with excellent impact, under the leadership of both a lecturer-scientist and of a physician scientist.

RECOMMENDATIONS TO THE TEAM

This team has left the unit in October of 2019 so giving recommendations to it at this time is not relevant.

Team 2: Physiopathological interactions between the immune system and its microenvironment

Name of the supervisor: Mr Christopher Mueller

THEMES OF THE TEAM

The team studies the pathophysiological interactions of the immune system with its microenvironment with a particular interest in macrophages and dendritic cells in lymphoid tissues and skin. The development of an innervated and immunocompetent skin model allows to study mechanisms implicated in the development of atopic dermatitis and viral arbovirus infection by mosquitoes.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

1-The expert committee recommends recruiting postdoctoral researchers. The project is too broad and should be better focused. The expert committee suggests prioritizing the objectives".

As far as the committee correctly analyzed the composition of the team along this mandate (2017-2022), only 2 post-doctoral researchers joined the team. The present committee observes that the projects are still too broad and delivers the same recommendations as the last expert committee.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	1
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	1
Subtotal permanent personnel in active employment	3
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	5
Subtotal non-permanent personnel	6
Total	9

EVALUATION

Overall assessment of the team

The overall assessment of this team is excellent.

The scientific outputs are of high quality with publications in very important journals (PNAS, Immunity....). The innervated and immunocompetent skin model allows the development of a large number of studies in both autoimmunity and viral infections. The team has a national and international visibility through collaborations and its implication to obtain european and 2 ANR funds as partner.

Strengths and possibilities linked to the context

The team has highlighted for the first time the dialogue between mesenchymal cells and lymphatic endothelial cells, particularly in the lymph node. Team 2 also explored molecular mechanisms and demonstrated that cellular communication is mediated by members of the TNF superfamily, (RANK-RANKL). Their results are based on the study of many different models using well-established experimental methods. In addition, the team has been studying immune cells from human skin explants. The team recently developed through a collaborative work with a Canadian research group, an innovative human skin model with sensitive innervation and immunocompetent cells.

Between 2017 and 2021, Team 2 published 14 original scientific articles, 6 reviews and 4 book chapters involving permanent and non-permanent staff members. Team 2 researchers sign original scientific papers in the first position and as last author/corresponding author showing a dynamic publication activity. PhD students and post-docs also participate in publications and present their work (orally and by poster) at several national and international congresses. Team 2 members collaborated with an internationally renowned group and co-published their work. Indeed, the work published in *Immunity* includes 10 other authors from 3 other high-level laboratories in Switzerland and Japan. The study published in *Acta Biomaterialia* on a 3D model of human skin is a collaborative work with a Canadian laboratory.

The recognition of the team for the development of different methods of reconstruction of skin models allowed the appointment of a researcher of the team to the direction of the Research Group on Organoids (CNRS GDR 2102).

Weaknesses and risks linked to the context

Among the 14 scientific articles published in 5 passed years only 5 were last signed / corresponding author by team members. Given the expertise in skin organoid models, it would be beneficial to implement partnerships with companies.

RECOMMENDATIONS TO THE TEAM

The committee recommends to further refocus the research projects and reinforce the more promising and advanced ones (e.g. immune cells from skin implants studies), by either recruiting a full-time scientist and/or attract more post-doctoral researchers to increase the team's driving force. As mentioned, developing industrial partnership should be a way to be investigated by the team.

Team 3: Physiopathological mechanisms and therapeutic regulation of the auto-immune responses

Name of the supervisor: Ms H  l  ne Dumortier

THEMES OF THE TEAM

This team, composed of two full-time scientists and one senior physician-scientist, focuses on systemic autoimmune diseases, lupus erythematosus and Sj  gren's disease. The team develops fundamental scientific studies which have been recently focused on the compromised activity of BTLA4 (B and T lymphocyte attenuator) in T lymphocytes of lupus patients. On the other hand, the team is also involved in a large number of clinical studies carried out by the rheumatologist team member. A strong collaboration with team 4 aims to develop novel methods of targeting drug delivery to immune cells in autoimmune settings by using functionalized carbon nanoparticles.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

1-The expert committee encourages the team to publish in journals of higher impact

A senior author of the team signed one JCI Insight article in the last position during the last years. 90% of scientific articles were published in good to very good quality journals, demonstrating the important efforts the team has performed to reach these objectives.

2-The expert committee recommends to clarify the methodology used to isolate TFH and the approach regarding the nanoparticles.

The present committee did not address this technical point.

3-The projects should be prioritized

The team abandoned the project on regulatory follicular T cells considered too competitive.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Charg�� de recherche, CR) and associate	1
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises priv��es)	0
Research supporting personnel (PAR)	1
Subtotal permanent personnel in active employment	4
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	0
PhD Students	5
Subtotal non-permanent personnel	6
Total	10

EVALUATION

Overall assessment of the team

The scientific production by the team is very good for fundamental studies and excellent for clinical studies.

This team brings together full-time scientists and clinicians interested in systemic autoimmune diseases, which has enabled original insights in patient immune cell perturbations. The team also is quite active in developing links with pharmaceutical companies based on the scientific and clinical expertise of its members. However, only one of the full-time scientists has signed experimental work in senior position. First author publications of PhD students are limited and should be reinforced.

Strengths and possibilities linked to the context

The attractiveness of the team is average, as reflected in invitations and in funding acquisition. Thus, with the exception of the senior rheumatologist, tenured team scientists have been invited only once or 3 times, respectively, over the reporting period. The senior rheumatologist has benefitted from significant recognition, obtaining distinctions and participating in committees elaborating European recommendations for clinicians.

The production by the team is very good and has benefited from the availability of lupus patient samples for the full-time scientists. This has enabled one team member together with doctoral students to demonstrate defective upregulation and signaling by BTLA4, a protein inhibiting excessive signaling in T lymphocytes. Two publications in *JCI Insight* and *Front. Immunol.* have resulted from this work. Other data on functional tertiary lymphoid structures in lupus kidneys and on a transcriptomic signature of lymph node stromal cells remain to be published.

A strength of the team is its collaboration with team 4, aiming to develop novel carbon nanoparticle devices for targeted therapeutic drug delivery in autoimmune conditions. This work has also resulted in collaboration with groups outside of the unit.

The rheumatologists in the team have participated or organized numerous clinical studies and led several clinical trials. Clinical original publications and reviews constitute a major part of the team's production. PhD and MD students sign publications resulting from their work in the first position and some have been awarded prizes for presentations of their work.

The team has been very active in developing links with pharmaceutical companies. Two of these exploited the technical and scientific know-how of the team (contracts with Medimmune and Amgen), while others were linked to the clinical activity of the team rheumatologists (partnerships with Bristol Myers Squibb, Pfizer and Lilly). The team also obtained support for a project concerning plant-derived virus-like particles as vaccines. Finally, team members participated in some events communicating science to the general public including students in primary education.

Weaknesses and risks linked to the context

Full-time scientists receive few invitations to talk in congresses or at other institutions, to submit reviews or to participate in editorial journal boards.

The team has had more limited success in funding acquisition than other unit teams, disposing of less than 100 k€ grant money in all but one years, and not having benefited from a national ANR grant since 2016.

The number of first author publications signed by PhD students trained in the team is limited.

RECOMMENDATIONS TO THE TEAM

The committee recommends focusing on a more limited number of subjects that have already proven to be productive, for example the project concerning BTLA, and the projects concerning characterization and transcriptomics of stromal cells in kidney-draining lymph nodes and tertiary structures in lupus kidneys. The committee also recommends seeking stronger collaboration between the three tenured scientists of the team and the PhD students supervised by them, which should be helpful for ensuring that students all have a good chance of obtaining first-author publications.

The committee encourages the team scientists to seek additional funding from national and international sources.

Team 4: Therapeutic multifunctional carbon and 2D nanomaterials
 Name of the supervisor: Mr Alberto Bianco

THEMES OF THE TEAM

The research theme of Team 4 is to study 2D and carbon-based nanomaterials, and their biomedical applications, which is highly interdisciplinary and at the interface of chemistry, materials and biomedical sciences. Specifically, Team 4 has developed new therapeutic approaches for the treatment of cancer and autoimmune diseases. Team 4 has also studied the impact of different materials on health in order to propose their application fields. In particular, Team 4 has evaluated the effect of nanomaterials on the cells of the immune system to provide data and foundation for future clinical translation.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Team 4 has addressed the recommendations from the previous evaluation, namely biodegradability assay of the carbon-based materials and materials refining.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	2
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	1
Subtotal permanent personnel in active employment	3
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	3
PhD Students	8
Subtotal non-permanent personnel	11
Total	14

EVALUATION

Overall assessment of the team

The overall assessment of the team is outstanding.

The team has an outstanding record for scientific publication both in quality and quantity as well as in fund raising at both national and EU levels.

The interdisciplinary work of this team, at the interface between chemistry, materials science and biology, is recognized at the national, European and international level, with a network of collaborators in Europe, Asia and the United States.

Team 4 has many interactions with industrial partners via the European projects, but still has difficulties in interacting with the pharmaceutical and drug industry. The team is actively involved in the drafting of procedures and recommendations for the authorization to register graphene by the European Chemicals Agency in order to verify the applicability of the OECD guidelines to graphene-based materials.

Strengths and possibilities linked to the context

Team 4 leads the chemical research projects on which the interdisciplinary immunology-therapeutic chemistry activities of the unit relies on. The scientific objectives are well defined. The achievements and the perspectives are advanced and state-of-the-art positioned.

The team is composed by 3 permanent members: the team leader (DR1 CNRS), a scientific researcher (DR2 CNRS), an Assistant Engineer and by a large number of non-permanent members: in November 2022, 4 post-doctoral researchers and 8 PhD students were present. The team has obtained numerous grants from national public agency (ANR programme CE09, 2018-2022), CNRS institution (AAP 2018, PRIME 2021) and regional fundings (Labex CSC, 2015-2019 and 2017-2020). The team has major contribution to the construction of the European research area through its recurrent commitment in H2020 consortium (2017-1022, 2018-2020, 2020-2023). International fruitful collaborations are also engaged, assessed by the joined grants with Japan (IRP 2020-2024) and Singapore (MERLION 2019-2022). Overall, the team has gathered human resources and fundings that are suited to pursue and secure its research activity.

The team has an interesting attractiveness at the national, European, and international levels. The team leader is involved in the management of various international committees, he is for example member of the executive committee of the Graphene Flagship organisation. He also exerts scientific expertise in different boards (Observatory of Micro and Nanotechnologies, "Xi'an Huaqing Haikang Graphene Institute of Medicine and Healthcare", China). The team researchers are members of editorial committees or reviewers (Nanomaterials, Carbon). They are also invited to numerous conferences and organize a certain number of them, always at the national and international level (CNBMT19, Tenth Symposium on Carbon Nanomaterial Biology, 1st European Conference on Chemistry of Two-Dimensional Materials). The team participates in the drafting of European recommendations in the context of its expertise field (autorisation d'enregistrement du graphène par l'ECHA Agence Européenne des produits chimiques, selon les lignes directrices de l'OCDE). Finally, awards and distinctions obtained by the Team leader confirm the attractiveness of the team (Médaille d'Argent CNRS, Membre élu de l'Académie européenne des sciences).

The Team has an outstanding publication record in both quality and quantity. It has 100 publications in high level international interdisciplinary journals such as Nature Communications, Angewandte Chemie, Advanced Materials, Advanced Functional Materials, ACS Nano, Small, Nanoscale, Carbon, etc. All publications are available in the HAL-CNRS (<https://hal-cnrs.archives-ouvertes.fr/>) and UnivOAK (<https://univoak.eu/>) archives.

The contribution of the research activities of the Team 4 to society is globally excellent. It exchanges with consumer associations and local social organizations about risks / benefits of nanoparticules. Team 4 is recognized in France and internationally for its interdisciplinary work on the chemistry of carbon-based nanomaterials and their biomedical applications (therapeutics, imaging etc). The team has developed collaborative projects with industrial partners at the European level (Flaship Graphene, RADDEL, DIAGONAL) and is involved in the studies on health impact and biomedical applications of graphene in link with industrial and medical applications. Team 4 has a global proactive approach to valorize its research, protect intellectual property and file patents. The team is in discussion with the SATT Conectus Alsace to evaluate the patentability of new hydrogels products. The Team is involved in public outreach through local scientific events, interviews in social media, presentations on benefits & risks of nanoparticules, (fête de la science, collège, lycée, médiathèque..).

Weaknesses and risks linked to the context

The relation and interaction of Team 4 within the unit is only established with Team 3. No collaborative project with Team 2 has been presented, neither in the DAE nor during the visit. The number of permanent staff is low compared to the number of PhD students. The team has no in-house cancer model for cancer research, and also encountered some difficulties in the valorisation of its research.

RECOMMENDATIONS TO THE TEAM

The committee recommend more interaction and collaboration with other teams, which may strengthen the overall objectives of the unit and further promote the visibility and attractiveness of the unit. It is also important for Team 4 to recruit permanent scientists in CNRS or Inserm or university of Strasbourg in order to balance the number of PhD students. Instead of having cancer model in house, it is also very wise to set up collaborations with cancer experts on site, or at national and international level.

CONDUCT OF THE INTERVIEWS

Date

Start: 27 October 2022 at 08:30

End: 27 October 2022 at 18:30

Interview conducted: online

Visio-conference agenda

- | | |
|----------------------|--|
| 9h15 – 9h30 | Committee pre-start meeting
<i>Closed-door meeting</i> |
| 9h30 – 9h35 | Hcéres Rules and procedures by A.M. Di Guilmi
<i>Public Session (all unit members)</i> |
| 9h35 – 10h35 | Administrative and scientific presentation of the unit by the director
40 min presentation + 20 min discussion
<i>Public Session (all unit members)</i> |
| 10h40 – 12150 | Scientific presentations by group leaders
10 min presentation + 10 min discussion
<i>Public Session (all unit members)</i> |
| 10h40 – 11h00 | Team 1. Pauline Soulas-Sprauel |
| 11h05 – 11h25 | Team 2. Christopher Mueller |
| 11h30 – 11h50 | Team 3. Hélène Dumortier |
| 11h55 – 12h15 | Team 4. Alberto Bianco |
| 12h15 – 12h45 | Debriefing-1 committee
<i>Closed-door meeting</i> |
| 12h45-13h30 | Lunch Break |
| 13h30 – 14h15 | Meeting with ITAs (in French). Split committee
<i>In the absence of any managing staff (DU, team leaders)</i> |
| 13h30 – 14h15 | Meeting with post-docs and PhD students. Split committee
<i>In the absence of any managing staff (DU, team leaders)</i> |
| 14h15 – 15h00 | Meeting with researchers. Full committee
<i>In the absence of any managing staff (DU, team leaders)</i> |
| 15h00 – 15h40 | Meeting with institution representatives: Inserm/University of Strasbourg
<i>Closed-door meeting</i> |
| 15h40 – 16h00 | Debriefing-2 committee
<i>Closed-door meeting</i> |
| 16h00 – 16h30 | Meeting with the unit director
<i>Closed-door meeting</i> |
| 16h30 – 19h30 | Redaction of the final report
<i>Closed-door meeting</i> |
| 19h30 | End of the interview |

GENERAL OBSERVATIONS OF THE SUPERVISORS

Université

de Strasbourg

Monsieur Éric Saint-Aman
Directeur du Département d'évaluation de la recherche
HCERES - Haut conseil de l'évaluation de la recherche et
de l'enseignement supérieur
2 rue Albert Einstein
75013 PARIS

Strasbourg, le 9 juin 2023

Objet : Rapport d'évaluation DER-PUR230023127 - I2CT - Immunologie, immunopathologie et chimie thérapeutique

Réf. : RB/FF/ 2023-437

Rémi Barillon

Vice-Président Recherche,
Formation doctorale et Science
ouverte

Cher Collègue,

L'université de Strasbourg vous remercie ainsi que tous les membres du comité HCERES pour le travail d'expertise réalisé sur l'unité de recherche « Immunologie, immunopathologie et chimie thérapeutique » (I2CT – UPR 3572).

Affaire suivie par :

Florian Fritsch
Responsable du département
Administration de la recherche et
accompagnement des chercheurs
Tél : 03.68.85.15.19
florian.fritsch@unistra.fr

L'université de Strasbourg souhaite formuler une remarque de portée générale sur le commentaire suivant, page 16 :

"The expert committee recommends focusing on young MDs for PhD training. A true MD PhD program could be organized, since a bridge will come soon with the university as UMR with the CNRS."

In addition to individual initiatives for hosting MD in research laboratories, which can arise from clinical staff in these teams, an institutional MD-PhD program has been implemented at the University level since 2013. All research units have the opportunity, or have been involved in the early training in research of medical students (see <http://www.medecinesciences-strasbourg.fr/>)

La tutelle CNRS nous a indiqué qu'elle ne s'exprimerait pas sur le rapport d'évaluation à ce stade.

**Direction de la recherche et de la
valorisation**

4 Rue Blaise Pascal
CS 90032
F-67081 STRASBOURG CEDEX
Tél. : +33 (0)3 68 85 15 80
Fax : +33 (0)3 68 85 12 62
www.unistra.fr

Je vous prie d'agréer, Cher Collègue, l'expression de mes cordiales salutations.


Rémi Barillon

The Hcéres' evaluation reports are available online:
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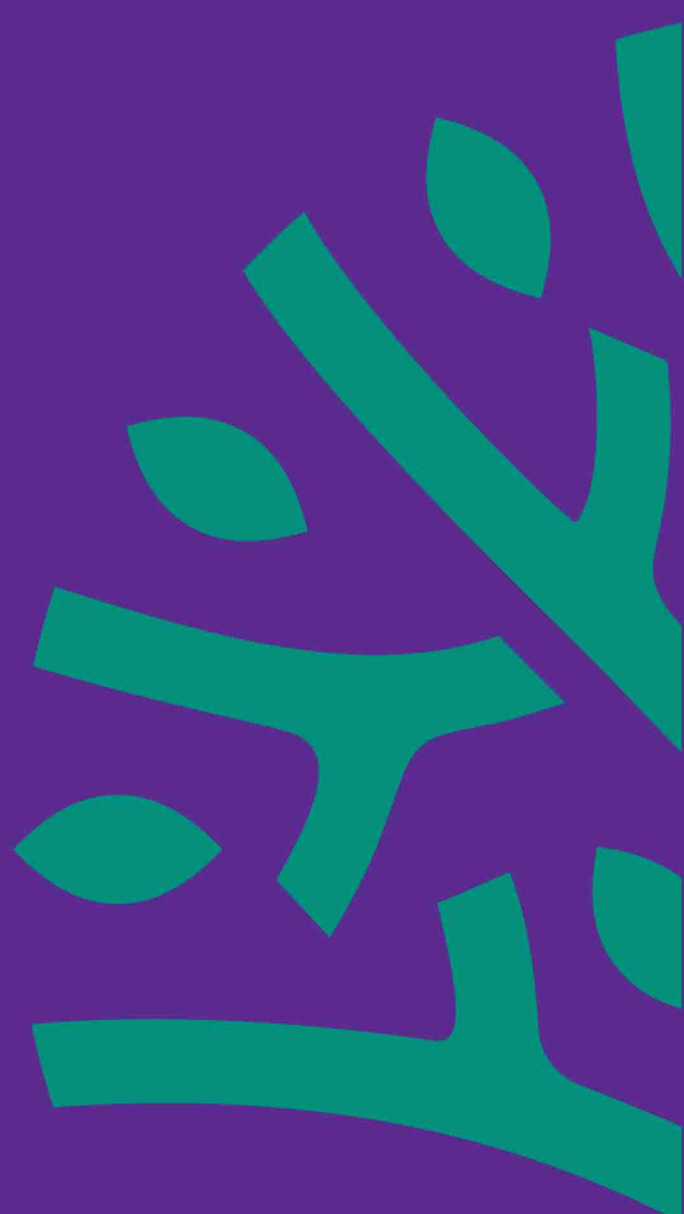
Evaluation of Universities and Schools

Evaluation of research units

Evaluation of the academic formations

Evaluation of the national research organisms

Evaluation and International accreditation



2 rue Albert Einstein
75013 Paris, France
T. 33 (0)1 55 55 60 10

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