



Research evaluation

EVALUATION REPORT OF THE UNIT  
MCT - Membranes et Cibles Thérapeutiques

UNDER THE SUPERVISION OF THE  
FOLLOWING ESTABLISHMENTS AND  
ORGANISMS:

Aix-Marseille Université - AMU

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

Ministère des armées

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**EVALUATION CAMPAIGN 2022-2023**  
GROUP C

Report published on April, 11 2023

High Council for evaluation of research and higher education



In the name of the expert committee<sup>1</sup> :

Priscille Brodin, Chairwoman of the committee

For the Hcéres<sup>2</sup> :

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29th November 2021:

<sup>1</sup> The evaluation reports "are signed by the chairperson of the expert committee". (Article 11, paragraph 2);

<sup>2</sup> 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

<b>Chairperson:</b>	Ms Priscille Brodin, Center for Infection and Immunity of Lille
	Mr Nicolas Blanchemain, Université de Lille (representative of CSS Inserm)
<b>Experts :</b>	Mr Alain Filloux, Nanyang Technological/University, Singapore
	Mr Marc Lecouvey, Université Paris 13 (representative of CNU)
	Mr Niclas Setterblad, Sorbonne Paris Cité (supporting personnel)

## HCÉRES REPRESENTATIVE

Ms Muriel Mercier-Bonin

## CHARACTERISATION OF THE UNIT

- Name: Membranes et Cibles Thérapeutiques
- Acronym: MCT
- Label and number: SSA UMR\_MD1, Inserm U\_1261, AMU
- Composition of the executive team: Mr Jean Michel Bolla

## SCIENTIFIC PANELS OF THE UNIT

SVE4 Immunité, infection et immunothérapie

Panel 1

SVE7: Prevention, Diagnosis and Treatment of Human Diseases

Panel 2

ST4: Chemistry

Panel 3

SVE1: Basic and Applied Environmental Biology, Evolution

## THEMES OF THE UNIT

MCT is a one-team research Unit, which was created in 2018 with affiliations to three host institutions, "Service de Santé des Armées" (SSA), Inserm (CSS7) and "Aix-Marseille Université" (AMU).

MCT research activities are at the chemistry-microbiology interface. Its scope is on the cell envelope of Gram-negative bacteria in relation with antibiotic transport and resistance, along three axes. The first one is about basic approaches concerning the characterization of the bacterial envelope and its role in antibiotic transport. The second axis deals with the analysis of bacterial response to current antibiotics with focus on membrane functions and efflux. The third axis is on drug discovery with state of the art medicinal chemistry.

## HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

MCT is a joint research Unit with two distant locations: School of Pharmacy at Marseille and "Institut de Recherche Biomédicale des Armées" (IRBA) at Brétigny sur Orge.

The relocation of MCT lab in Marseille at the School of Pharmacy was achieved in 2018 thanks to the AMU support.

The Unit's premises consist of 600 m<sup>2</sup>, with 108 m<sup>2</sup> for BSL1 and 293 m<sup>2</sup> for platforms.

There are 40 m<sup>2</sup> for offices for the 4 administrative staff.

## RESEARCH ENVIRONMENT OF THE UNIT

MCT is a member of the Institute of Microbiology, Bioenergy and Biotechnology (IM2B) of AMU, which regroups other units performing active research on bacteria, for instance "Bioénergétique et Ingénierie des Protéines" (BIP), "Laboratoire de Chimie Bactérienne" (LCB) and "Laboratoire d'Ingénierie des Systèmes Macromoléculaires" (LISM). IM2B brings together interdisciplinary research, education, and a unique technological facilities network, to reinforce its visibility and international attractiveness.

MCT is part of ABRomics, which is a numerical platform to store, integrate, analyze, and share multi-omics data on antimicrobial resistance gathering experts at the national level on antimicrobial resistance.

MCT gathers two platforms. The Bac-Screen platform, having the "Aix-Marseille Site Technology Platforms" label since 2019, performs antibiotic susceptibility testing on a panel of bacteria. The PiT2 platform is part of "Marseille Proteomic" that hold an IBiSA label. It is equipped with a Gas Chromatography system coupled to Mass Spectrometry (GC-MS), a Liquid Chromatography system coupled to tandem Mass Spectrometry (LC-MS-MS) and Matrix Assisted Laser Desorption Ionization - Time of Flight (MALDI-TOF), enabling identification and characterization of small molecules.

MCT is member of two "Groupements de Recherche" (GDR) affiliated to CNRS, ChemBioScreen and Chemobiology.

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

<b>Permanent personnel in active employment</b>	
Professors and associate professors	1
Lecturer and associate lecturer	4
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)	16
<b>Subtotal permanent personnel in active employment</b>	<b>23</b>
Non-permanent teacher-researchers, researchers and associates	7
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	6
<b>Subtotal non-permanent personnel</b>	<b>14</b>
<b>Total</b>	<b>37</b>

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

Employer	EC	C	PAR
Aix-Marseille Université	4	0	8
Ministère des Armées	1	0	7
Inserm	0	1	1
CNRS	0	1	0
<b>Total</b>	<b>5</b>	<b>2</b>	<b>16</b>

## UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	716
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)	0
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	1 228
Own resources obtained from international call for projects (total over 6 years of sums obtained)	80
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	483
<b>Total in euros (k €)</b>	<b>2 507</b>

## GLOBAL ASSESSMENT

MCT is an excellent Unit with a unique expertise in biology and chemistry. Its original focus of research on antimicrobial resistance (AMR) is a very important topic in public health. The activities cover basic understanding and translational development regarding bacterial membranes, membrane-associated antibiotic resistance and novel therapeutic antibacterial drugs. The scientific outputs in fundamental research are excellent and will have to be maintained in the next contract.

There is an excellent balance between biology and chemistry, with a chemistry component that could be reinforced in the future. The recruitment of new persons with background in medicinal chemistry, by supporting applications for Inserm position or attracting researchers for mobility, would indeed allow to reach the needed critical mass.

The Unit is very active in its interactions with the socio-economic world and based on its patenting activities, it should maintain this momentum and seek for licensing opportunities. With several responsibilities in professional licence and Master courses, it is also actively involved in University training. However, its participation in actions to disseminate knowledge to the general public and to promote research remains limited and should be reinforced in the future.

There is a general well-being for all the staff categories. Despite two distant locations, the Unit is well structured, with regular meetings and good support of the staff, in particular regarding the management of the numerous equipment and core facilities. It has in place all the technical expertise to address the relevant biological issues in the AMR fields. In particular, to improve the visibility and efficiency of the Bac-Screen platform, a business developer has been appointed by AMU to be shared with two other platforms on the Timone campus. The person will contribute to the dissemination of the Unit's know-how to industry, and to the search for new customers. The Unit would deserve to reinforce its premises in terms of office and lab spaces and benefit from AMU active support.

The Unit must continue to strive for European grants and ANR funding in leader position. It has also to put in place a strategy for recruiting post-docs, but also for helping young scientists gain in visibility and leadership. This will allow to set up a strategy for the long-term future direction.

## DETAILED EVALUATION OF THE UNIT

### A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

*The team leaders of the Unit should aim to publish in journals of generally higher IF and therefore limit the number of small publications.*

With regards to the previous period, the Unit had a net increase of medium to high level publications (+50%) during the reporting period.

*The continuity and complementarity between the study of translocation of molecules across biological membranes undertaken by team 1 and the identification of new therapeutic targets by team 2 is a real asset. The merging of the two teams is a good thing and should be supported to strengthen such integrated approaches.*

This has been successfully implemented in the period.

*Considering that some of the major funding (IMI and ITN) are ending in 2017, search for large academic funding (long-term ones) should be favored to increase the sustainability of the Unit and also to increase the ability of the Unit to publish large and deep studies in high level international journal. Efforts should be made to recruit postdocs to enable more rapid progress in the various on-going and planned research projects.*

The Unit has joined a new national consortium (ABROmics), secured ANR grants (COPOTIC and SpiceUp), AMIDEX and Inserm grants and attracted one post-doc from India. The Unit trained several PhD students and the access to the PhD training at AMU is particularly appreciated by the IRBA staff.

*The Unit is encouraged to envisage actions of transfer of information to the population. For example via their Website or by creating a twitter account. Visibility on social networks is important as a way of communication with the public concerning the research results obtained by the Unit in the area of antibiotics and resistance. The diffusion of this information at large as it stands is "minimalist".*

The Unit has a state-of-the-art dedicated Website (<https://mct.univ-amu.fr/>). It interacts with patients and families from the French Cystic Fibrosis association. It also trains soldiers and personnel in OPEX ("Opérations militaires extérieures de la France"), which is unique in France. One MCT member is involved in several organizations ("Centre d'appui et de Prévention des Infections Associées aux Soins" CPIAS-PACA; "Agence Régionale de Santé" ARS-PACA) responsible for the prevention and study of infectious risks in hospitals and nursing homes.

*The Unit has decided to focus on a set of bacteria for which they have a recognized know-how, but should be more precise on which are at the core of their projects.*

*Some efforts should be made not only to sustain the remarkable networks of interactions with pharmaceutical companies but the type of interactions should be clarified as should be the objectives and outcomes.*

*At the core of their projects, MCT has a focus on ESKAPE bacteria, for instance *E. coli*, *K. pneumonia*, *Enterobacteriaceae* and *P. aeruginosa* on one hand. On the other one, SSA tackles high danger risk bacteria, such as *Y. pestis*, *B. pseudomallei* and *B. thailandensis* that are classified as NRBC (Nuclear, Radiological, Biological, Chemical) with the lives of civilians or soldiers at stake in OPEX.*

*The network of interactions with pharmaceutical companies is sustained by joint research funds and Cifre PhD scholarships.*

*The laboratory council should be revisited and reestablished so that election to the council includes not only researcher representatives but also postdocs, students and ITAs. The council should also hold regular meetings, likely more than the two per year which was indicated in the report.*

*A new laboratory council was put in place in 2018 with researchers, research support staff, students, and non-permanent representatives. The Unit has also bi-weekly meetings by video, the development and sustainable use of which were made possible during the Covid-19 pandemic.*

*The Bac-Screen platform should be opened to other academic laboratories. If this platform wants to be recognized as such by the institutional supports it needs indeed to meet some requirement and include a business plan. This is important and would provide some leverage to have the opportunity to recruit a permanent technical staff on the platform.*

*The Bac-Screen platform obtained the "Aix-Marseille Site Technology Platforms" label in 2019, which warrants its accessibility to other academic labs. The request for Bac-Screen services and quotation can be easily done via a dedicated website. A business developer has been recently appointed by AMIDEX to set up an ambitious business plan.*

*Efforts should be made to integrate all the personnel in decision making and to facilitate access to external speakers having wide ranging scientific interests.*

*The researchers and technical staff are well-integrated in decision making and the three institutions, AMU, Inserm and SSA, unanimously support MCT ambitions.*

## B - EVALUATION AREAS

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

#### Assessment on the Unit's resources

The resources are excellent considering the size of the Unit. In particular, it was able to recruit researchers and technical staff in microbiology. The various industrial contracts have allowed the recruitment of 4 Cifre PhD students. The presence of technological platforms allows the development of innovative technologies.

#### Assessment on the scientific objectives of the Unit

The scientific objectives of the Unit are excellent considering its transdisciplinary research. It presents a recognized expertise in the field of bacterial resistance, and associates all the necessary skills in biology and chemistry. It benefits from an excellent local environment and has numerous collaborations at the national and international levels.

#### Assessment on the functioning of the Unit

The functioning of the Unit is excellent considering the co-existence of two different geographical sites. It is well structured, with regular meetings and good support of the staff, in particular regarding the management of the numerous equipment and core facilities. It complies with all safety rules.

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

### Strengths and possibilities linked to the context

The Unit presents a recognized expertise in the field of bacterial resistance. It is perfectly integrated in the scientific landscape of Marseille and can be complementary to large institutes such as the "Institut Hospitalo Universitaire".

The integration of chemistry in all the Unit's activities allows to have a global vision of scientific questions, from the understanding of biological problems to the design of molecular tools to solve them.

The AMU/Inserm/SSA triple affiliation allows the Unit to get recurrent funds of about 115 k€/year. In addition, industrial partnerships and successful proposals provide additional resources averaging 336 k€/year. The industrial contracts have allowed the recruitment of 4 Cifre PhD students (Virbac, DEINOVE). Two projects funded by ANR (COPOTIC and SpiceUp as partners) during the period complete these resources. The success of the projects is based on the permanent development of innovative technologies and on the use of three technological platforms (Bac-Screen, PiT2 and SSA sequencing platform).

In terms of human resources, the small size of the Unit makes it very reactive. It is composed of personnel coming from Inserm, SSA and AMU. There are 30 persons on average (16 in Marseille and 14 in Brétigny sur Orge). MCT is composed of many technical staff (60% of the Unit's staff), which allows for optimum management of the numerous equipment and facilities present in the Unit.

During the reporting period, the Unit was able to recruit researchers and technical staff in microbiology (1 MCU AMU, 1 IR Inserm, 1 technician SSA) and the chemistry axis will be reinforced by a MCU PH in the next contract.

### Weaknesses and risks linked to the context

The Unit is spread over two sites, Marseille and Brétigny sur Orge, which does not facilitate face-to-face exchanges.

The SSA employees are only partially involved in the research activities of the Unit, but they appreciate very much what they can benefit from the activities of Marseille site for moving forward their research on NRBC bacteria.

The Unit is essentially composed of MCUs who are involved in many pedagogical and administrative tasks.

The Unit has only two researchers (1 CR and 1 MCU PH) in the chemistry axis.

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

### Strengths and possibilities linked to the context

The scientific objective is to understand the functioning of the bacterial membrane with the aim of designing new therapeutic agents. This corresponds to the standard of a very high quality research in the field of antibiotic resistance. Such objective is ambitious but the Unit knows exactly where its expertise stands.

The subjects developed by MCT are part of the priority program of the Ministry of Higher Education and Research on antibiotic resistance but also a major axis for the World Health Organization.

The scientific project is perfectly mastered by the MCT members and associates all the necessary skills in biology as well as in chemistry.

MCT benefits from an excellent local environment, as being a part of IM2B. It also participates in two GDR programs, Chemobiology and ChemBioScreen.

The Unit has numerous international collaborations in Europe and beyond (Dublin City University, Ireland; Stockholm University, Sweden; Jagiellonian University in Krakow, Poland; Jacobs University Bremen and Helmholtz Center, Germany; Catholic University of Louvain, Belgium; University of Florida, USA; University of Auckland, New Zealand; University of Queensland, Australia; University of Tunis, Tunisia; Centers in Georgia, Kyrgyzstan and Kazakhstan).

The scientific policy of the Unit is ensured in a collegial way with all its members. Recruitments are decided according to the scientific issues to address.

### Weaknesses and risks linked to the context

The development of new generation antibiotics requires a long-term collaboration with the industry because of the costs related to the development of a new drug. In this context, the Unit's public-private partnerships are still a little too light for early discoveries to translate into clinical candidates.



### *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

MCT predominantly hosts women (70% of the staff) with a man as director and a woman as deputy director. Since 2021, MCT has a referent for professional equality between men and women at the request of the University and Inserm. The director has participated at several meetings to raise awareness on these aspects. The Unit is very sensitive to the promotion of their female collaborators. A great deal of autonomy is given in order to help them build their own scientific career.

The members of the Unit work in both chemistry and microbiology. As such, they are exposed to both chemical and biological risks. In 2019, an assistant for the prevention of professional risks has been appointed and a single document has been produced. MCT has made significant investments to ensure the safety of its personnel, including permanent and non-permanent staff, and devotes an annual budget for maintenance.

MCT applies a strict chemical waste treatment policy with a sorting of liquids and a treatment by a specialized company. As far as biological waste is concerned, the inactivation of pathogenic biological samples is systematic.

The management of the computer equipment is ensured by the University IT services.

In order to limit its carbon footprint, MCT favors video conferencing for meetings.

#### Weaknesses and risks linked to the context

The increase in equipment maintenance costs may impact the fee-for-service prices on the platforms.

## EVALUATION AREA 2: ATTRACTIVENESS

### Assessment on the attractiveness of the Unit

The attractiveness is very good to excellent, with timely research topics, a positive funding situation, national and international communications, and the quality of the Bac-Screen and PIT2 platforms. However, most of the funding is as partner and few post-docs have been recruited.

### *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

Four members of the Unit are actually contributing the most to disseminate their research. The Unit presented about 30 conferences, including Interscience Conference on Antimicrobial Agents & Chemotherapy (ICAAC), at the European Society of Clinical Microbiology and Infectious Diseases (ECCMID) and the "Société Française de Microbiologie" (SFM). Two members were invited to prestigious international conferences such as the Gordon Research Conferences (GRC) on Antimicrobial discovery (2022, Italy) or Efflux systems (2019, Italy).

Members participate in editorial committees of specialized journals perfectly in line with their expertise: *Membranes*, *Antibiotics*, *Letters in Drug Design and Discovery*, *Letters in Organic Chemistry*, *Current Medicinal Chemistry*.

The Unit reviewed grants for international institutions (Horizon H2020 MSCA from 2016-2021) and for the "Ministère de l'Enseignement Supérieur et de la Recherche et de l'Innovation" and as expert for Hcéres (2020-2022).

One member was involved in the organisation of the international conference "ABC of Membrane Transports" (2017-2021).

One member did a 3-month stay in 2018 at the Center for Superbugs at the University of Queensland, Australia. The Unit has numerous collaborations in Europe: Dublin City University (Ireland), Université Catholique de Louvain (Belgium), Helmholtz Institute for Pharmaceutical Research Saarland and Jacobs University Bremen (Germany), Università di Cagliari (Italy), Stockholm University (Sweden), Jagiellonian University (Poland). Outside of Europe, links are with the "Université de Tunis-El Manar", the "Université Libanaise", the University of Karachi and the University of Queensland. The Unit also collaborates with research institutes in Georgia (Eliava Phage Therapy Center), in Kyrgyzstan (IBT), in Kazakhstan (Research Institute for Biological Safety Problems) and in Russia with Bashkir State University.

## Weaknesses and risks linked to the context

The participation to editorial boards, committees or conference organization is reported for several members but none of them plays key or leading roles, which is also reflected by the lack of peer-recognition such as academy fellows or awards.

### *2/ The Unit is attractive for the quality of its staff hosting policy.*

## Strengths and possibilities linked to the context

MCT has the advantages of a small Unit. For instance, the staff provides strong support and guidance for teaching, recruitment and promotion.

The Unit attracted researchers and technical staff, which enabled establishing new skills in chemistry, protein biochemistry and bacterial genetics.

The Unit invited reputed scientists from University of Auckland (New Zealand) and Catholic University of Louvain (Belgium). For instance, a PHC grant ("Programme Hubert Curien") "Tournesol" with the PI of a laboratory at the Catholic University of Louvain allowed his visit to Marseille twice (2018 and 2019).

The Unit has sound recognition by SSA/IRBA personnel.

The Unit is recognized for its teaching activities and pedagogical responsibilities.

## Weaknesses and risks linked to the context

The Unit is likely to suffer from competition from other far bigger research entities within the AMU landscape.

The Unit has its own research niche but it attracts mostly local staff who have been through the Unit or historically "bound" by collaboration.

The Unit suffers from a lack of post-docs, in particular international ones.

### *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 members are doing laudable efforts to secure external grants from a broad range of sources. MCT succeeded in securing around 350 k€ per year, with a total of 1 650 k€ over the five-year period.

Funding sources include Inserm in collaboration with the University of Strasbourg (15 k€, Startin) and recently an IRP (International Research Program) from Inserm in collaboration with the Catholic University of Louvain, a grant from the South Region, 3 grants from the "Agence de l'Eau" (420 k€ 2020-2024), 13 NRBC grants (686 k€ in total) and two grants from "Vaincre La Mucoviscidose" foundation (5 k€ each). The Unit contributed to two European consortia: FEAMP (80 k€, 2017-2022) and PMG7 (2017-2021). It also benefited from ANR support with 3 projects as partner: ResisPhages (funded by the "Direction Générale de l'Armement, ASTRID programme", 2014-2017, 15 k€), COPOTIC (185 k€, until 2025) and SpiceUp (223 k€, until 2024).

## Weaknesses and risks linked to the context

Despite some applications, the Unit has lacked so far to succeed in over-the-million external or EU funding.

Most of the funding is as partner.

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

## Strengths and possibilities linked to the context

The Unit acquired new microbiology/biochemistry equipment (in 2019) and a microscope and a high-volume centrifuge (in 2021) to reinforce its capacities on its recurrent funds. In addition, Inserm supported the acquisition of equipment for chemistry (HPLC-Mass and flow chemistry device) with 15 k€ in 2018 and 80 k€ in 2020.

The Unit has also access to the electron microscope Titan Krios in its BSL3 premises, allowing studies on BSL3 pathogens, which is so far the only one installed in France.

## Weaknesses and risks linked to the context

The attractiveness of the platforms and their use are short of technician manpower and still limited by lack of active business support.

## EVALUATION AREA 3: SCIENTIFIC PRODUCTION

### Assessment on the scientific production of the Unit

The scientific production of the Unit is excellent. It is original, regular and quantitatively very high in a large panel of general and speciality journals. With at least 2 publications per student, PhD students and post-docs made a major contribution to this scientific production.

*1/ The scientific production of the Unit meets quality criteria.*

## Strengths and possibilities linked to the context

The scientific production is original, quantitatively very high with 147 publications both in paid and open access journals over the six-year period and regular since 2016 (on average 25-30 articles per year). It is based on solid theoretical and methodological fundamentals with regard to the main lines of research proposed by MCT. There is a significant contribution in the chemo-biology field starting from clinical analysis to the proposal of therapeutic targets or new compounds through the understanding of resistance by original characterization methods.

The visibility of MCT is excellent with 64 of publications as main first, senior or last author (43%) in a large panel of general and speciality journals, among them one article in *Nat. Protoc.*, one in *Nat. Commun.*, one in *Nat. Rev. Microbiol.*, a review in *Clin. Microbiol. Rev.*, articles in *J. Med. Chem.*, *J. Antimicrob. Chemother.*, *Antimicrob. Agents Chemother.*, *Int. J. Antimicrob. Agents*, *Commun. Biol.*, *PLoS Negl. Trop. Dis.* and *Life Science Alliance* (from the *EMBO Press*).

PhD students and post-docs made a major contribution to the scientific production of the Unit (at least 2 publications per student). The national and international co-publications show the notoriety of MCT in its field of research. For example, at the national level, MCT publishes with "Institut Jacques Monod", "Université Grenoble Alpes", "Institut National de la Recherche Agronomique", University of Bourgogne-Franche Comté. The number of international collaborations increased (e.g. University of Queensland, University of Central Florida, "Institut Pasteur de Madagascar", Queen's University Belfast, Newcastle University, Jacobs University Bremen).

## Weaknesses and risks linked to the context

The visibility of some publications is moderate.

Production and international partnerships are mainly provided by 3-4 people from MCT, including 1 director of research emeritus.

*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 scientific production is in line with the research potential of the Unit.

There are excellent interactions between the two geographical sites (Marseille and Brétigny sur Orge) through publications, which contributes strongly to the consistency of the MCT theme.

All PhD students and post-docs actively participate in the scientific production of MCT, from 2 to 6 publications per student.

## Weaknesses and risks linked to the context

The amount of publications is not uniformly distributed among all the Unit's researchers.

This gap is accentuated when publications with international teams are taken into account.

### 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 of MCT respects the principles of scientific integrity, ethics and open science. The data quality and the use of appropriate controls for experimental approaches are well-implemented and notably based on solid transmission by mentors.

The researchers systematically submit their publications to HAL as requested by Inserm and AMU.

MCT publishes articles in 'open access' journals (e.g. *Comm. Biology*, *PLOS One*, *Scientific Reports* or *Pharmaceutics*) allowing unlimited availability of research work. This strategy, combined with the diversity of journals, allows for a wide dissemination of the Unit's work while targeting a specific audience at the same time.

#### Weaknesses and risks linked to the context

The dissemination of MCT results obtained via private-public partnerships is complex.

## 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 excellent. Fully in line with its activities on antibiotic resistance and the development of new infection control strategies, it has developed collaborative research projects with various private companies, including the setting up of Cifre contracts. With several responsibilities in professional licence and Master courses, the Unit is actively involved in University training.

### 1/ *The Unit stands out by the quality of its non-academic interactions.*

#### Strengths and possibilities linked to the context

The Unit interacts with patients and families from the French Cystic Fibrosis association.

The Unit has access to clinical samples from military hospitals ("*Hôpital d'Instruction des Armées*" Laveran (Marseille) and Saint Anne (Toulon)). MCT also trains staff from the military hospital "*Val-de-Grâce*" in Paris.

MCT is deeply involved in training against NRBC-E risks to soldiers and personnel in OPEX, which is unique in France.

One MCT member is involved in several organizations ("*Centre d'appui et de Prévention des Infections Associées aux Soins*" CPIAS-PACA; "*Agence Régionale de Santé*" ARS-PACA) responsible for the prevention and study of infectious risks in hospitals and nursing homes.

#### Weaknesses and risks linked to the context

The relatively small-size of the Unit limits the overall number of its interactions with the non-academic world.

### 2/ *The Unit develops products for the socio-economic world.*

#### Strengths and possibilities linked to the context

The Unit developed collaborative research projects with HTS-Bio Company, Virbac and Algram, which tackled both human and animal health. This is of importance for the 'One Health' national objectives.

MCT trained three PhD students with Cifre grants from Virbac company, focused on the development of new compounds towards treatment of infectious diseases in animals. There were also staff exchanges with personnel from the private sector.

The MCT platforms performed fee-for service for companies on demand regarding antimicrobial resistance and the development of new strategies to treat infections.

The Unit filed 8 patents since 2018 thanks to its strong innovative capacity in chemistry. It has been made possible through interactions with the CiNAM laboratory in Marseille as well as the BioMérieux company.

To improve the visibility and efficiency of the Bac-Screen platform, a business developer has been appointed by AMU to be shared with two other platforms on the Timone campus. The person will contribute to the dissemination of the MCT know-how to industry, and to the search for new customers.

#### Weaknesses and risks linked to the context

No patent has been licensed.

The platform activities of MCT are limited by its too little manpower for the development of new collaborations.

*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 University training (responsibilities in professional licence and Master courses).

The Unit actively participates in educational efforts such as the "Apprentis Chercheurs", a program aiming at receiving school pupils in the lab and familiarizing them to the research environment. As such, MCT welcomes a pair of high school and middle school students each year since 2020.

One MCT member is responsible for a social network for the prevention of infectious diseases.

#### Weaknesses and risks linked to the context

Due to its modest size and constraints imposed by the Ministry of the Armed Forces, the Unit is restricted in its communication to the general public.

## C - RECOMMENDATIONS TO THE UNIT

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

The committee suggests to consolidate the balance between the research activities in biology and chemistry. It agrees that, in order to pursue the development of ambitious projects, it will be necessary to reinforce the chemistry component. The recruitment of new persons with background in medicinal chemistry, by supporting applications for Inserm position or attracting researchers for mobility, would indeed allow to reach the needed critical mass.

With regards to the generation of PhD students and young researchers, the committee recommends to intensify the Unit's support in building their future research carrier e.g. by promoting participation to international conferences and networking activities.

The Unit would deserve to reinforce its premises in terms of office and lab spaces and benefit from AMU active support.

The platforms having national labels would increase their visibility if they were reinforced by technical staff.

The Unit's public-private partnerships should be reinforced for early discoveries to translate into novel drug clinical candidates.

The current director of the Unit will be over 67 at the end of the next term. The committee suggests to already think of the strategy for the future direction of the Unit.

### Recommendations regarding the Evaluation Area 2: Attractiveness

The director and the research director emeritus should help the young scientists gain in visibility and leadership at the national level but also international level.

The Unit must continue to strive for European grants and ANR funding in leader position.

The Unit must put in place a strategy for recruiting post-docs.

## Recommendations regarding Evaluation Area 3: Scientific Production

The committee recommends to maintain the excellent scientific outputs in fundamental research.

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

Considering the number of promising patents, the Unit should seek for licensing opportunities with the strong support of the SATT Sud-Est.

## CONDUCT OF THE INTERVIEWS

### Date

**Start:** 12 December 2022 at 08:30

**End:** 12 December 2022 at 18:30

**Interview conducted: on-site or online**

### INTERVIEW SCHEDULE

<b>8:30-9:00</b>	<b>Hcéres Committee meeting</b> <i>Closed-door meeting</i>
<b>9:00-9:05</b>	<b>Hcéres rules and procedures by M. Mercier-Bonin</b> <i>Public session (all unit members, INSERM manager of Health Technologies Theme-Based Institute, INSERM CSS7 mission manager, Vice-Dean Research Faculty of Pharmacy)</i>
<b>9:05-10:10</b>	<b>Scientific and administrative presentation of the Unit</b> 20 min. Overall presentation of the Unit <i>J-M. Bolla</i> 10 min. Presentation of major results in the chemistry part <i>J-M. Brunel</i> 10 min. Presentation of major results in the microbiology and antibiotic resistance part <i>F. Neulat-Ripoll</i> 10 min. Presentation of major results in the entry of antibiotics in gram-negative bacteria part <i>M. Masi</i> 15 min. Discussion <i>Public session (all unit members, INSERM manager of Health Technologies Theme-Based Institute, INSERM CSS7 mission manager, Vice-Dean Research Faculty of Pharmacy)</i>
<b>10:10-10:30</b>	<b>Committee debriefing and break</b> <i>Closed-door meeting</i>
<b>10:30-10:50</b>	<b>Meeting with ITAs (in French)</b> <i>In the absence of any managing staff</i>
<b>11:00-11:20</b>	<b>Meeting with researchers</b> <i>In the absence of any managing staff</i>
<b>11:30-11:50</b>	<b>Meeting with post-docs and students</b> <i>In the absence of any managing staff</i>
<b>11:50-13:00</b>	<b>Lunch break</b>
<b>13:00-13:40</b>	<b>Meeting with institution representatives: Aix-Marseille University, INSERM (manager of Health Technologies Theme-Based Institute, CSS7 mission manager, regional delegate), Service de Santé des Armées (SSA), Faculty of Pharmacy</b> <i>Closed-door meeting</i>
<b>13:40-14:15</b>	<b>Committee debriefing</b> <i>Closed-door meeting</i>
<b>14:15-14:30</b>	<b>Break</b>
<b>14:30-15:00</b>	<b>Meeting with the Director of the Unit</b> <i>Closed-door meeting</i>
<b>15:00-15:15</b>	<b>Break</b>
<b>15:15-18:30</b>	<b>Redaction of the final report</b> <i>Closed-door meeting</i>
<b>18:30</b>	<b>End of the interview</b>

## 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](mailto:cecile.merle@univ-amu.fr)

Vos réf :  
DER-PUR230023304 - MCT - Membranes et cibles thérapeutiques

Marseille, le dimanche 9 avril 2023

Madame, Monsieur,

Je fais suite à votre mail du 08/03/2023 dans lequel vous me communiquez le rapport d'évaluation Hcéres de l'Unité de Recherche MCT - Membranes et cibles thérapeutiques.

Comme demandé dans ledit mail, je vous indique que les tutelles du MCT, Aix-Marseille Université et l'Inserm, 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](http://www.hceres.fr)

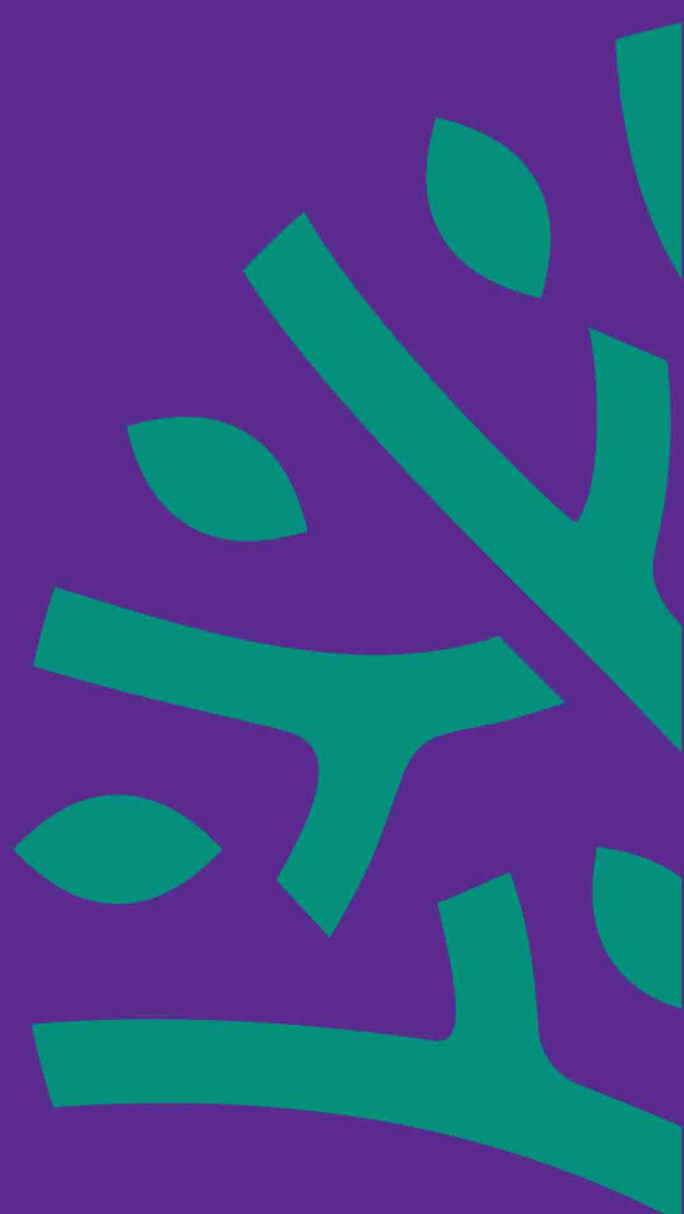
**Evaluation of Universities and Schools**

**Evaluation of research Units**

**Evaluation of the academic formations**

**Evaluation of the national research organisms**

**Evaluation and International accreditation**



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

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