Research evaluation

EVALUATION REPORT OF THE UNIT

Micalis - Microbiologie de l'alimentation au service de la santé

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

AgroParisTech,
Institut national de recherche pour l'agriculture, l'alimentation et l'environnement - Inrae
Université Paris - Saclay

EVALUATION CAMPAIGN 2024-2025
GROUP E

Rapport publié le 11/04/2025

High Council for evaluation of research and highter education

In the name of the expert committee :

Jean-Michel Jault, chairman of the committee

For the Hcéres :

Coralie Chevalier, president

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

To make the document easier to read, the names used in this report to designate functions, professions or responsibilities (expert, researcher, teacher-researcher, professor, lecturer, engineer, technician, director, doctoral student, etc.) are used in a generic sense and have a neutral value.

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:	M. Jean-Michel Jault, Centre national de la recherche scientifique - CNRS, Lyon
Experts:	Mr. Alan Dobson, University College Cork Mrs. Christiane Forestier, Université Clermont Auvergne (representative of the CNU) Mrs. Ina Bergheim, University of Vienna Mrs. Stéphanie Schüller, University of East Anglia Mr. François Leulier, CNRS, Lyon Mrs. Mylène Robert, CNRS, Grenoble (representative of the supporting personnel) Mr. Pablo Ivan Nikel, Technical University of Denmark Mrs. Clara Belzer, Wageningen University Mrs. Muriel Cocaign-Bousquet, Institut national de recherche pour l'agriculture, l'alimentation et l'environnement - Inrae, Toulouse (representative of CSS Inrae)

HCÉRES REPRESENTATIVE

Mrs. Ina Attrée
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REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr. Elias Fattal, Faculty of pharmacie, Université Paris - Saclay
Mr. Etienne Augé, Université Paris - Saclay
Mrs. Véronique Coxam, Inrae
Mr. Christophe Chassard, Inrae
Mrs. Nathalie Touze, Inrae
Mr. Jean-Denis Faure, AgroParisTech

CHARACTERISATION OF THE UNIT

- Name: Microbiologie de l'Alimentation au service de la Santé
- Acronym: Micalis
- Label and number: UMR 1319
- Number of teams: 23
- Composition of the executive team: Mr. Philippe Noirot, Director of Micalis, Mr. Philippe Langella, Deputy Director, Head of the thematic pillar « Food and Digestive Ecosystems », in charge of innovation and industry partnership, Mr. Romain Briandet, Deputy Director, Head of the thematic pillar « Bacterial Adaptation and Pathogenesis », in charge of outreach and the Micalis website design, and Mrs. Rut Carballido Lopez, Deputy Director, Head of the thematic pillar « Systems and Synthetic Microbiology », in charge of regional and European interactions and funding opportunities

SCIENTIFIC PANELS OF THE UNIT

Panel 1
SVE3: Living Molecules, Integrative Biology (From Genes and Genomes to Systems), Cell and Development Biology for Animal Science
Panel 2
SVE2: Plan and Animal Production (Agronomy), Plant and Animal Biology, Biotechnology and Biosystems Engineering
Panel 3
SVE4: Immunity, Infection and Immunotherapy

THEMES OF THE UNIT

Micalis focuses on conducting innovative, high-quality research on microorganisms linked to food, the gut microbiota, sustainable food production, and human health. They study in particular microorganisms that are found in (i) Food Microbiomes (i.e., for fermentation or preservation, or the transmission of foodborne pathogens); (ii) Symbiotic Microbiomes whose imbalances often contributing to the development of human diseases; (iii) Model bacteria or yeasts to conduct fundamental research and that can be used to engineer metabolic pathways or as cellular factories for producing valuable molecules.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The Micalis joint research unit (JRU) was established in 2010 through the merger of eight Inrae and AgroParisTech research units spread on four separate sites in the south of the Île-de-France region. The physical integration of all Inrae units at Jouy-en-Josas started in 2014 after the creation of a new building and was completed by 2016. in 2020, the Bacterial Pathogens and Health (BaPS) team from the Université Paris-Saclay became officially associated to Micalis and they joined the Université Paris-Saclay main campus together with the Faculty of Pharmacy in 2022. In 2022-2023, Micalis faced a space shortage due to increased research funding and appealed for additional facilities. Renovations of building 224 at Jouy-en-Josas began to accommodate these needs by mid-2024, emphasising sustainable practices, though this will impact the carbon footprint and operational costs.

RESEARCH ENVIRONMENT OF THE UNIT

During the evaluation period, Micalis had to face a significant transformation with the creation of the University Paris-Saclay (Université Paris-Saclay) in 2020, formalising its association through a Joint Research Unit (JRU) agreement involving Inrae, more particularly the MICA (Microbiology and Food Chain) and ALIM H (Human Nutrition) departments, the AgroParisTech (i.e. the Life Sciences and Health, and the Sciences and Processes of Food and Bioproducts departments), and Université Paris-Saclay. This affiliation spans several graduate schools from the Faculty of Pharmacy of Université Paris-Saclay, to which the unit strongly contributes, emphasising interdisciplinary research in microbiology, food processing, and health. The JRU agreement runs until 2025, with a possible renewal following the Hcéres evaluation.
The Micalis unit has been actively engaged in the France 2030 investment plan, either being at the onset and/or strongly contributing to key initiatives such as:
- PEPR (Programmes et équipements prioritaires de recherche) "Food Systems, Microbiome, and Health" (SAMS): it is notably focused on understanding the roles of microbiomes in nutrition and chronic diseases, with Micalis scientists being heavily involved, e.g. a scientific committee including the co-direction of this PEPR or coordination of different projects.
- PEPR "B-BEST": Targeting sustainable biomass conversion technologies, with Micalis scientists playing a major role, one of them being part of the executive committee and one of the the coordinators.
- Grand Challenge "Ferments du Futur" (FdF): Advancing research in fermentation and food sustainability.

- PEPR "BBTI": Developing innovative biotherapies for the future, with Micalis leading a key project on extracellular vesicles from Gram-positive bacteria.
- IHU Prometheus: A collaborative health research program, with extensive contributions from Micalis teams (12 in total).
Additionally, Micalis participates in regional initiatives under the Île-de-France DIM patronage, such as BioConvS (biofoundry development), DOH 2.0 (One Health), and ITAC (immunotherapy and cancer). These projects strengthen Micalis' role in advancing cutting-edge research and fostering collaboration across academia notably with clinicians, and also with industry through translational research with the help of the SATT Paris-Saclay.

UNIT WORKFORCE: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	9
Maîtres de conférences et assimilés	11
Directeurs de recherche et assimilés	30
Chargés de recherche et assimilés	52
Personnels d'appui à la recherche	106
Sous-total personnels permanents en activité	**208**
Enseignants-chercheurs et chercheurs non permanents et assimilés	17
Personnels d'appui non permanents	37
Post-doctorants	17
Doctorants	54
Sous-total personnels non permanents en activité	**125**
Total personnels	**333**

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: in physical persons at 31/12/2023. Non-tutorship employers are grouped under the heading "others".

Nom de l'employeur	EC	C	PAR
Inrae	0	79	95
U PARIS SACLAY	11	0	4
AGROPARISTECH	8	0	6
AUTRES	1	3	1
Total personnels	**20**	**82**	**106**

GLOBAL ASSESSMENT

The global assessment of the Micalis unit is "excellent". The unit's research is closely aligned with key scientific priorities defined by funding bodies and public policy, focusing on critical microbiology issues such as food quality preservation, host-pathogen interactions, and microbiomes in chronic diseases, all of which are vital for human and animal health. The unit has excelled in securing funding, particularly through the France 2030 programs, positioning it well for future success. However, there are concerns about a decline in permanent technical staff, which could threaten the sustainability of some projects, though this is currently mitigated by its capacity to hire temporary staff. Micalis is recognised for its collegial leadership and strong team morale, but the aging leadership and the need for renewal present both a challenge and an opportunity for younger scientists to step into leadership roles. The unit scientific output is of high quality, generally considered very good to excellent, though with some variability across teams, and it has made significant strides to publish findings in open-access, peer-reviewed journals. It comprises 1,100 publications and 40 book chapters, with 55% authored

by Micalis. The research has a broad international reach, with work published in leading journals such as Nature Microbiology, Nature Communications, mBio, eLife, Nucleic Acids Research, and Gut. Several research themes, including nutrition-host-microbiome interactions in health and disease, as well as synthetic biology approaches, are recognised globally. Notable highlights include pioneering research on microbial enzymes in the microbiota, especially those utilising S-adenosyl-L-methionine radicals in antibiotic synthesis, and the development of metabolic pathways and genetic circuits for use in both whole-cell and acellular systems.
The Unit's appeal is also exceptional. In addition to organising 80 international conferences and congresses, Micalis members have participated in over 350 conferences, with 93 of these involving invited presentations at prestigious events such as Biofilms, Nutrition, EMBO workshops, Gordon conferences, and symposia on the Human Microbiota in Health and Disease.
Micalis has a strong tradition of valorising research, evidenced by numerous patents and start-ups, as well as a substantial portion of its budget coming from industrial contracts. In addition, the unit has set an internationally recognised biofoundry for cell-free systems, rather unique worldwide, and also a culturomics platform. Overall, Micalis is at the forefront of the French and European research in Microbiology.

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

- "In order to improve the grant success rate, a robust, obligatory, internal grant application review process should be established. The principle would be that two-three people systematically read a grant proposal, suggest changes, and are prepared to discuss the matter with the applicant/writer".
This recommendation was not followed as the unit was particularly successful in raising funds over the period under evaluation.

- "The relation with the industry is excellent but can still be improved, as there are too few large-scale industrial contracts."
Several contracts with private organisations totalise ~ 0.5 M€. In addition, Micalis teams utilised structured partnerships, such as the creation of a Labcom (ANR) with a medium-size company, and a "Unité Mixte Technologique" (UMT) funded by the Ministry of Agriculture, to foster long-term collaborations with industry.

- "The unit would benefit from more internationalisation (collaborations and invitations), in order to attract more foreign students and postdocs and to increase its international visibility."
Several Micalis teams benefited from a network of international collaborations and the unit is counting on their cutting-edge technological facilities to strengthen their recognition at European and even international level.

- "Communication from the direction of the unit toward teams or communication within teams should be improved. One should ensure that information is passed on. One suggestion is that the unit organises a weekly newsletter with all the important decisions and scientific news."
The unit relies on each team leader to convey the decisions taken at the level of the Core to the team members but this is unequally respected and depends on the team leader. No weekly newsletter has been implemented so far but a new website has just been built which might ease the transmission of information or decision taken.

- "Besides the PhD day, there are few common activities of the postdocs and PhDs. They should have a mailing list, organise social activities and PhD and/or postdocs' council(s). They should present their results in "work in progress" seminars open to the whole institute".
Besides the seminars organised to share team progresses at the institute level, the point regarding the social activities of the PhD/postdocs was not really addressed.

- "Selected senior researchers of Micalis should be asked to act as confidential advisors for PhD students".
In 2022, Université Paris-Saclay introduced a committee to monitor doctoral researchers' progress throughout their PhD, eliminating the need for other advisors.

- "Welcome package for students and postdocs also has to be improved and more help for legal papers upon the arrival of foreign students should be provided. In general, communication between Inra and University administration could be improved".
A welcome package already exists for newcomers but see the recommendations section.

- "Given the highly competitive nature of the Institute's focus on Food, Gut Microbiome and Health, it is important that the name 'Micalis' becomes a synonym of these topics. Further, stronger and more direct links to clinical medicine would be highly beneficial, and should be encouraged to ensure that direct translation of observations/new approaches to treatments is achievable."
This point has been addressed thanks to the creation of the Hospital-University Institute (IHU) Prometheus involving twelve Micalis teams with 49 researchers. In particular, two Micalis scientists are co-leaders for the projects focused on host-pathogen interactions notably during sepsis, and on patient endotypes and treatable traits. The key partners of this IHU are the "Assistance Publique – Hôpitaux de Paris", CEA, Inserm, and Inrae.

- "It is important to consider the 'uniqueness' offered in comparison to other directly competitive institutes such as Cork and Norwich. This may require some realignment of scientific priorities over time, but should ensure greater financial stability by increasing the range of grant calls to which applications can be written."
The funds successfully raised by the unit through the calls of the Ile-de-France region and France 2023 support and strengthen the unique position of Micalis in France and allows this unit to remain at a competitive level in Europe.

- "There is a clear critical mass of researchers at Micalis. The overall level of interaction and collaborations across the institute is disappointing. Facilitating the breaking down of the Team silo mentality must be a priority to truly realise the latent potential of the institute. This will require time and encouragement to ensure effective co-

operation between groups, with care needed to ensure all groups be given equal opportunities irrespective of size."
To improve the cooperation between teams, two transversal axes were created, Alibiote and FAMe that are supported by the unit resources aiming at fostering new collaborations through internal calls. Moreover, the technological developments of state-of-the-art platforms create an inspiring environment that should spark new collaborations. Also, the partnership with the MGP unit on the Inrae site has been reinforced through joint projects, for a mutual benefit with a complementary of expertise and technologies.

- "**We vigorously insist that an independent, external, Scientific Advisory Board (SAB) is established**. There is a view that the current plans are a little insular and such a SAB will enable optimising the longer-term strategy and trajectory of the institute. This SAB should include both external academics and industry representatives."
Despite the willingness of the unit direction to implement a SAB and given the collegial way the unit is driven, a majority of team leaders appeared to be reluctant to call on an outside committee. It is important to recall that a SAB can give insightful advice about the unit future. It should not be considered as a way to counteract the scientific policy of the unit but, rather, it can accompany the scientific orientations of the unit (see the recommendations section).

- "Finally, there should be a real strategy from the direction of the unit for the replacement of team heads who retire."
Since 2021, a discussion has been engaged between several teams (still ongoing for 7 of them) and the Codir to find the best transition possible when a team leader plans to retire, in particular for the remaining staff.

B - EVALUATION AREAS

Guidelines for all areas of evaluation (1, 2, 3 and 4): Considering the references defined in the unit's evaluation guidelines, the committee ensures that a distinction is made on the outstanding elements for strengths or weaknesses. Each point is documented by observable facts, including the elements from the portfolio. The committee assesses if the unit's results are consistent with its activity profile.

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

Assessment on the scientific objectives of the unit

The scientific objectives of Micalis are right on target regarding those defined by the funding bodies, or more generally by the public policy. They focus on essential aspects of Microbiology such as food quality or preservation, host-pathogen interactions, role of microbiomes in chronic diseases…. These are all major societal issues for human, or animals, well-being. Micalis is also strongly involved in education to promote Microbiology at Université Paris-Saclay.

Assessment on the unit's resources

The unit has been incredibly successful in raising funds, both at the European and national level, especially in the recent years, and it took notably full advantage of the France 2030 programs. This is an outstanding achievement that puts Micalis unit in a very comfortable situation for the coming years. Regarding the staff, there is an alarming decrease in the number of permanent technicians/engineer assistants that could jeopardise the future of some projects, which is temporarily compensated for by hiring many people on fixed-term contract.

Assessment on the functioning of the unit

Micalis is led in a very collegial way that seems to be appreciated by the majority of the staff. There is an overall feeling of well-being in the unit. The steady decrease in permanent technical staff poses a serious threat that might impact the quality of the science in the future. Likewise, aging of several leaders (teams or platforms) and their renewal is another concern but this can be an opportunity for younger scientists to claim for leadership position.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

As mentioned above, Micalis is part of the Université Paris-Saclay, one of the leading universities in France and among the top 20 universities in the world, which creates a huge opportunity to attract talented students. Micalis scientists are fully dedicated to the structuration of the programs taught at Université Paris-Saclay as they actively participate in executive committees of three graduate schools (GS) in Life Sciences, i.e., Life Sciences and Health, Biosphera, Health and Drug Sciences, and they play major roles in Microbes – a Centre for Interdisciplinary Microbial Sciences at Paris-Saclay and also in two Doctoral Schools, ABIES and ITFA. The strong commitment to education is highlighted by the fact that among the 23 teams forming the Micalis unit, 20 have teaching activities and two out of three platforms are also involved in teaching duties. Of note, four Masters of Université Paris-Saclay are led by Micalis scientists with additional implications in AgroParisTech School and the Faculty of Pharmacy. Beyond the Micalis mission to shape the teaching of modern microbiology, the different GS also promote collaborations between institutes of Université Paris - Saclay through specific calls, an opportunity ceased by Micalis teams (i.e., 4 projects funded in 2022-2023)

Regarding Inrae policy, it outlines a roadmap addressing future challenges in agriculture, food, and the environment, aligning with public policy goals. Micalis has actively contributed to shaping strategic plans for its supervising divisions, MICA and ALIMH. MICA focuses on microbiology research related to the food chain, animal and human health, and biotechnology, with goals such as studying microbiomes, optimising microbial systems, and controlling pathogens. ALIMH emphasises the relationship between nutrition and health to promote sustainable diets and address toxicological risks. These two Inrae divisions have defined grand scientific objectives and Micalis is at the forefront of the research for six of them.

Micalis research also aligns with AgroParisTech focus on food transition and human health and Université Paris-Saclay strategic challenges in health, biodiversity, and food. On top of that, the objectives of Micalis are fully in line with those defined in France 2030 investment plan and the unit is strongly benefiting from three «Programmes et équipements prioritaires de recherche» (PEPR) that are co-directed by Micalis scientists. Moreover, unit members are also strongly involved in the Grand Challenge "Ferments du futur" (FdF), a public-private partnership aiming to promote innovation in ferments, fermented foods and biopreservation for healthier food products. Two additional entities that shape the research in the Micalis unit are (i) the IHU Prometheus already mentioned in which some teams are actively contributing to via the coordination of work packages, and (ii) the region Île-de-France through the DIM programs, Micalis scientists being involved in three of them. This allows in particular the development of a cell-free Biofoundry (including also funds coming from the PIA ICFREE and the Equipex Aladin) led by Micalis scientists and also the deployment of a digital workflow platform (Galaxy-SynBioCad).

Weaknesses and risks linked to the context

The huge supports coming from different institutional bodies (e.g. the Region Île-de-France) or the investment fund Programmes (e.g. France 2030) has created a major boost for the science performed in the unit. This nevertheless shapes the science performed by the unit in order to fit with societal issues (e.g. the food preservation). As long as the funding bodies maintain their ambitions and goals, the impact will remain extremely positive for the unit and one can only hope that the political context for the future will not affect this strategic orientation.

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

Strengths and possibilities linked to the context

The Unit has been extremely successful in raising funds especially in the last couple of years and notably through the France 2030 investment plans (3 PEPR and a FdF grant), Horizon Europe, the Region Île-de-France calls, or the creation of the IHU Prometheus. In addition, they also increased their success rate to the ANR calls and obtained major grants from Europe (e.g. ERC, MSC-ITN…) of from private foundations (i.e. Impulscience 2022 from the Bettencourt-Schueller foundation or 2022 award from Mécénat, AXA Santé foundation). In total, Micalis has witnessed a 41% increase in its resources coming from research contracts from 2020 to 2023, with an increase of 2.2 M€ (close to 7 M€ in total in 2023 for the research contracts) with 388 contracts from different sources over the entire reporting period. Additional infrastructural funds were also obtained from Inrae for the two technological facilities, Cultissimeo and Gut-on-Chip.

Regarding the infrastructure and due to the burgeoning of research programs, a renovation of the building 224 was approved by Inrae. This will increase the space of the unit by 700 m2, and it will soon notably accommodate the two new technological platforms of the unit, Cultissimeo and Gut-on-Chip.

In terms of human resources, a junior professor's chair (CPJ), was recently awarded to a young scientist and this position will be shared between Micalis and MGP units for laboratory and office space. This will strengthen the collaborations between these two Inrae units. Over the reporting period, the number of researchers remains constant in the unit (~ 80) but there was an alarming decrease in the number of technicians (27%) on permanent contracts with a moderate decrease in engineers (8%). In the meantime, a large increase in agents on contracts took place.

Weaknesses and risks linked to the context

The steady decrease of assistants or technicians seems to be mainly due to outgoing mobility motivated by the high cost of living in the Île-de-France region. This is really worrisome and this quite often leads to an additional burden for common tasks that lays on the remaining staff. This might have a very negative impact on the different projects of the unit that have to face a shortage of permanent technical support. Permanent staff, particularly technicians/engineers, are at the heart of the teams, ensuring that know-how is properly passed on.

3/ The unit's practices comply with the rules and directives laid down by its supervisory bodies in terms of human resources management, safety, environment, ethical protocols and protection of data and scientific heritage.

Strengths and possibilities linked to the context

Micalis is governed in a collegial way at three levels:
- The Executive Committee (the Codir composed of the DU, DUAs, DUA-RP in charge of thematic pillars, DUA-RH, DUA-GFA, and joined more recently by the Transversal axes coordinators). It is in charge of strategic orientation, budget and HR management. The gender balance is well equilibrated in this committee (4/4);
- The team leaders' committee (Core) is in charge of the scientific strategy and unit life;
- The Unit Representative Council (CdU) is responsible for operational and regulatory matters, and it is formed by elected members from the different staff categories, and by appointed members.
In addition, there is a general assembly twice a year to present to the whole staff the key decisions and the evolution of the unit.

Permanent staff and more particularly engineers and technicians had the feeling that the success rate for promotion was insufficient. To remedy this problem, the unit direction implemented an internal assistance cell in 2021 to counteract this negative outcome, thereby helping the agents to get promoted. This seems to have a positive impact on the promotion rate, i.e. 6 in 2023 v 1 in 2021, with an increase in the number of candidates applying to promotion campaigns.

There is on average 144 members of Micalis who attend a training session every year on different topics, from scientific to societal issues, which highlights the implication of the staff in the life of the unit. Within Inrae centres, like at the Micalis level, there is a strong commitment to gender equality and diversity, and special attention is given to employees with disabilities. Of note, there are currently an equal number of women and men (16) as team or platform leaders. Moreover, the unit is committed to ensuring the best safety conditions for its staff and to prevent any psychosocial risks and has implemented different measures to check the proper functioning in the laboratories (e.g. 11 prevention assistants, 13 biosafety labs strictly controlled and managed by 20 trained agents, disposal protocols for chemical or biological wastes, training of newcomers…). There is an overall feeling of well-being in this unit, and the DU and the whole direction of Micalis should be commended for that.

The data storage capacity has been significantly increased to cope with the ever-increasing amount of data generated in biology and there is an automatic backup of home and shared repertoires to secure all these data.

The unit complies with all the safety rules implemented by law on how to protect the staff, and how to handle chemical and biological wastes and GMOs. It is also engaged in sustainable practices to limit as much as possible its carbon footprint (i.e. creation of Green Micalis group in 2020).

In case of an emergency situation (e.g. the lockdown during the Covid crisis), a business continuity plan has been developed and is yearly updated.

To smooth the transition of the team leader (or platform leader) retirement, a succession plan has been implemented in the unit at least two years before the anticipated departure (discussion between the DU with the former and the proposed next team leader, with team members, and final validation in front of the Codir). This already occurred for seven teams (ComBac, Fine, GME, EpiMic, BIMLip/Cosynus and PAPPSO) and is ongoing or planned for seven others (Anaxem, CPE, FME, MIHA, Paroi, Phages and ProbiHôte).

Weaknesses and risks linked to the context

It is up to now the responsibility of team leaders to share the information discussed during the team leaders' committee (Core) with their team members. Yet, this is a process which varies depending on the team and for the sake of equality between all staff members, minutes of meetings should be made available to all on the intranet of the unit.

A major drawback of the ZRR is the difficulty to hire people from abroad, especially outside Europe and in particular those coming from 'sensitive' countries.

Regarding the age distribution of Micalis, it was highlighted in the report that 21% of the permanent staff is over 60 years old, which implies that they will retire before or during the next contract. This might threaten the future of some teams in particular those where the team leaders will retire (10 team leaders plus the Anaxem scientific manager, and 3 members of the unit's management, the DU plus two DUA).

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The unit is extremely attractive and was incredibly successful to raise funds, not only at the national but also at the European level. Likewise, the expertise of Micalis is internationally recognised through a strong involvement in different scientific committees and panels. This is an outstanding achievement.

Strengths and possibilities linked to the context

Regarding the scientific outreach, members of Micalis took part in 81 conferences and 20 workshops, 82% of which were international. They also played an active role as co-organisers (38 times) and invited or keynote speakers (101 times). In addition, they were strongly involved in partnerships with companies (102 research contracts) and two more specific collaborations (a Labcom and a UMT). They were supported by public and private foundations, including two major sponsorships from Foundation Bettencourt Schueller (2.3 M€) and Mutuelles Axa France (1M€). They participated in the scientific coordination of the Paris Region Fellowship program (H2020-MSCA-Cofund; 52 postdocs recruited for two years in the Paris area).

Thirteen scientists are members of editorial boards of twelve international peer-reviewed journals (e.g. Appl. Environ. Microbiol., J. Biol. Chem.), four hold associate editor positions, and eight have been guest editors for special issues or research themes. One scientist is a social network editor for FEMS Microbiology Reviews, and another one acts as recommender for PCI Microbiology.

Participation in evaluation processes highlights Micalis notoriety in Europe, as 39% of the 319 evaluation activities are conducted for international organisations, with a notable focus on European institutions (37%) and countries like UK (12%) and Switzerland (10%). Collaborations with Asia and South America stem from long-standing partnerships with some Micalis teams. In France, 195 evaluations primarily support supervising bodies (Inrae 28%, AgroParisTech 6%, Université Paris-Saclay 8%), other universities (9%), regional research councils (15%), and national entities like ANR (15%), Education and Research Ministry (5%) and Hcéres (4%). Additional contributions involve entities such as Inserm, CNRS, ANSES….
Micalis' expertise is also reflected by the involvement of its researchers in international organisations (e.g. EU Food 2030 roadmap and Green Deal, SABs), national and regional public authorities (e.g. SABs, the Regional Scientific Council of Île-de-France, scientific councils and steering committees), and this includes notably the scientific coordination of the French Gut project, the Vice Presidency of the Anses Ces "Assessment of Biological Risks in Foods", Scientific Committee of the French High Council for Biotechnology, and co-director of the PEPR Food Systems, Microbiomes and Health (SAMS). In addition, the expertise of Micalis scientists is acknowledged through their participation in scientific committees of different companies or foundations (Biocodex Microbiome

foundation and the Biocodex Microbiome Academy, Biofortis, Ysopia, Eurekare, Pileje, Maat Pharma, Exeliom Biosciences, Aerial, Actalia).

Several scientists received prizes or awards such as Highly Cited Researcher (3 scientists, 2 of them at least three years), Impulscience prize from the Foundation Bettencourt-Schueller, L'Oréal-Unesco Young Talents France for Women in Science, Grand Prix des Lauriers Inrae, and one was nominated EMBO Member.

Micalis is a major actor of the European research as testified by the ~ 25% of Micalis resources (2018-2020) coming from European funding. Micalis scientists obtained 8 prestigious ERC grants, participated in seven Marie Skłodowska-Curie Actions (e.g. 3 ITNs), and contributed to key European projects in Research Infrastructures and Future Technologies. Micalis teams coordinated seven projects and engaged in initiatives like the Joint programming Initiative, a COST action on Fermented Foods, and the European Space Agency. Notably, Micalis led two European Coordinated and Support Action (CSA) projects (Microbiome Support, IHMCSA) that advanced microbiome and synthetic biology research, culminating in the creation of the European Microbiome Centres Consortium (EMCC). EMCC fosters collaboration on standardisation, cohort coordination, and in human microbiome research.

In the footsteps of its impressive success for European funding, Micalis has obtained a high number of ANR grants (97) among which 36 are coordinated by a Micalis scientist. Importantly, all Micalis teams obtained at least an ANR grant over the report period. As previously indicated, the fund-raising success also includes the France 2030 programs, the FdF, the Grand Challenge du medicament and IHU Prometheus, as well as major funds from the Île-de-France area. Micalis scientists also obtained 50 contracts from Université Paris-Saclay and, on top of that, funds for translational research from the SATT Paris-Saclay (1.46 M€).
Micalis has a comprehensive hosting and career support policy to welcome and integrate new staff, with a focus on international researchers, doctoral students, and career development. In the period of 2018-2023, Micalis welcomed ~ 308 individuals per year on a fixed-term contract, about a third of whom were from abroad. Support includes detailed onboarding guides, access to the regional association "Science Accueil" for mobility assistance and free French language training.

Permanent staff undergo structured onboarding, including regulatory follow-ups with HR and supervisors, while fixed-term staff receive tailored administrative support. A welcome booklet is also provided. For newly recruited scientists, a seed funding, 30 k€ (CR, DR) and 10 k€ (PR, MCF), helps them start their projects.

Doctoral and postdoctoral researchers benefit from initiatives like Doc'Micalis and Doc'J associations, fostering scientific collaboration and community building. Additionally, Micalis supports PhD development through the Eden training program, which aids doctoral students and supervisors in project management, communication, and skill building.

Micalis also emphasises professional growth for research support staff. Competitive examination preparation and internal assistance initiatives have increased promotion applications and success rates. Front-line managers and unit directors receive specialised training to enhance their leadership skills.
Micalis hosts three advanced technical platforms:
- Anaxem: this animal facility specialises in germ-free rodents and birds or those with controlled microbiota. It serves both academic and private research, offering new techniques and equipment tailored to the user's needs. Anaxem is a partner in the PEPR SAMS targeted project Gnotanima.
- Pappso: this proteomics platform excels in high-throughput proteomics, metaproteomics, and bioinformatics, supporting projects like bacterial phosphoproteomics and intestinal microbiota research. With three mass spectrometers and plans to acquire a faster model by 2025, Pappso aims to handle large-scale analyses efficiently while maintaining its global reputation.
- MIMA2: a cutting-edge imaging platform that offers a range of imaging technologies from cellular to whole-organism scales. It supports multidisciplinary projects with 23 major instruments, including confocal systems and electron microscopes.

Equipment acquisition is guided by user committees and funded through institutional and national grants.
These platforms provide state-of-the-art resources and expertise, enhancing Micalis's scientific and industrial collaborations.

Weaknesses and risks linked to the context for the four references above

There is an inequity in the salary between newly recruited postdoctoral fellows and the older ones, with a higher pay for the new ones; this might lead to the leave of some experienced postdoc.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The scientific production of then unit is overall very good to excellent with some heterogeneity among the teams. A particular attention has been paid in the recent years to avoid predatory journals and this trend should be pursued in the future.

Strengths and possibilities linked to the context

Micalis achieved significant scientific output with 1153 articles (including 1095 referenced in WoS), 389 conference presentations, 243 posters, and 39 book chapters, with nearly all articles (>99%) published in peer-reviewed journals. Of these, 55% had Micalis scientists as lead authors (first, last and/or corresponding), showcasing their leadership role, while 25% involved PhD students, reflecting Micalis commitment to train future scientists. Open access accounted for 86% of publications, enhancing global reach. The unit productivity increased from an average of 163 articles/year during the previous contract to 191 articles/year (2018–2023), with notable achievements such as 26 highly cited papers and one "hot paper".

Some Micalis publications appear in high-impact journals like Nature Communications (21 publications), Gut Microbes (20), Microbiome (20), Gut (13) or highly specialised journal such as ACS synthetic Biology (7) emphasising the excellent research quality performed in the unit. However, there is still an important number of publications in journals of publishers such as MDPI that general spirit is by now considered as "predatory".

The number of publications with international collaborators underlines the high quality of the research performed in Micalis: 118 with the USA, 93 with England, 78 with Italy, 76 with Germany, 60 with Spain…

All the teams reported a number of publications for the period under consideration proportionate to its staff number. Micalis emphasises fair recognition of contributions in publications and patents for doctoral researchers, technicians, and engineers. This commitment is evident in the publication record of PhD students with 90% of the 106 PhD graduates that had at least one publication. Of note, among the eleven PhDs with no publications so far, seven of them defended in 2023, so their work will presumably be published soon. There is a general agreement in the unit that all staff members are associated to the publications in proportion to their implication.

Micalis is committed to scientific integrity, ethics, and open science by adhering to guidelines from Inrae, AgroParisTech, and Université Paris-Saclay. Micalis has implemented various measures to guarantee traceability and reproducibility of research results, including standardised lab notebooks, regular equipment checks, and a centralised data management system. The organisation also emphasises training in data management and ethical practices, aiming for 100% open access publications by 2030. Hence, training courses including scientific integrity and ethics of research projects are available for supervisors and PhD students, some being mandatory for PhD students. Also, it must be noted that Micalis takes any measure to make sure that scientific production is the result of research that respects human and animal life.

Weaknesses and risks linked to the context for the three references above

The awareness about ethics policies and predatory journals has only been implemented by supervising bodies since 2021. This explains why a peak of publication in MDPI journals was reached in 2022, but it declined in 2023. The level of publications in MDPI journals is nevertheless quite variable according to the different teams. Yet, the definition of predatory journals is still discussed in the scientific community, including Micalis scientists for some publishers (i.e. Frontiers). Although the researchers rightfully claim freedom to choose the journals in which to publish their results, the publishers should be carefully considered.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The culture of valorising results is deeply rooted in the laboratory's tradition, and this has led to the filing of numerous patents and the creation of several start-ups during the period under evaluation. This is a very strong asset of the unit, emphasised in particular by the large part of its budget coming from industrial contracts. This contribution to society is clearly an outstanding activity of the unit.

Strengths and possibilities linked to the context for the three references above

Seventeen Teams from Micalis obtained 106 private and industrial contracts for a total of 9.7 M€, representing ~ 29% of the total unit budget, but the repartition of these contracts is quite uneven between the different teams. The ProbiHôte team was the largest beneficiary, securing 60% of these contracts. The Fine, Combac, FME, Amipem, GME and B3D teams represented together 30% of the private contracts, the remaining 10% being shared between ten other teams. Micalis also maintained strong ties with industry through Cifre fellowships (19) and private doctoral contracts (5). The unit is increasingly involved in structured partnerships, such as the "Joint Laboratories" (Labcom) and Joint Technological Units (UMT), which foster long-term collaborations with industry. Notably, the Probihôte team obtained the first Inrae Labcom project with Pilèje focuses on Alzheimer's disease and the gut-brain axis. Another Labcom is under evaluation. Other teams, like B3D and FME, participate in initiatives to enhance food safety and biopreservation in collaboration with industry and research partners. These partnerships emphasise the integration of academic research with industrial expertise for practical applications in health, food safety, and sustainable development.

Micalis teams have filed 56 patents with a broad range of applications, including disease treatment or prevention using specific bacteria, biosensors, and protein production. Micalis scientists have also co-founded several start-ups, contributing to R&D efforts in diverse fields such as oncology, immunology, and microbiome therapies. Notable companies include MaaT Pharma, focused on microbiome-based cancer therapies; Exeliom Biosciences, developing treatments for inflammatory diseases and cancer; and Carembouche, creating protein-rich, probiotic-enriched food for undernourished populations. Other start-ups, like MicroXpace and Abolis Biotechnologies, are advancing innovations in animal health and custom microorganism production. Micalis has also supported the creation of Nodia Metabolics, a company developing metabolic health solutions and Novobiome, a company notably dedicated to cure some metabolic dysfunction and to screen for new biomolecules. These start-ups reflect Micalis strong commitment to translating scientific discoveries into real-world applications.

Micalis scientists actively share their expertise with the private and public sectors. They serve on scientific committees for companies (8 in total), e.g. Biocodex Microbiome foundation, Biocodex Microbiome Academy or Maat Pharma, as well as transfer organisations like ValleyDAO, which supports synthetic biology for climate solutions.
They also collaborate with international organisations (19 in total), advising on policy and regulation through initiatives like the EU Food 2030 roadmap and the Green Deal, and
coordinating global microbiome initiatives. Domestically, they engage with national and regional authorities (39 in total), participating in SABs and steering committees, such as the French High Council for Biotechnology and the PEPR Food Systems, Microbiomes, and Health project, while also leading key national research projects, e.g. the French Gut, or organisation, e.g. the Vice Presidency of the Anses Ces "Assessment of Biological Risks in Foods".

Micalis scientists participate in a wide range of activities to disseminate scientific knowledge to the general public. These include creating educational materials like board games and comic books, producing podcasts and webinars, and organising public events such as summer schools and exhibitions (e.g. "Salon International de l'Agriculture"). They also share data and software through open-access platforms and collaborate with media on documentaries and articles. Additionally, sixteen Micalis teams have participated in various public outreach activities (128 in total). But, again, this is quite unevenly distributed among teams with two of them contributing to 57% of these events, including TV and radio broadcasts, conferences, and exhibitions. These efforts involve both permanent and non-permanent staff, with a strong involvement of PhD students.

Weaknesses and risks linked to the context for the three references above

No particular weakness has been identified for this point.

ANALYSIS OF THE UNIT'S TRAJECTORY

The trajectory of the unit will consolidate its current research while exploring new areas related to microorganisms, host-microbiota interactions, and sustainable food production. Key goals include advancing food safety, sustainability, human and animal health, and biotechnological applications. This involves understanding the molecular mechanisms of microbiomes in health, developing new antimicrobial strategies, improving food quality and nutrition through microbial ecology, and applying synthetic biology for innovative bioproduction. Additionally, Micalis aims to deepen its research on complex microbial systems, with a focus on microbial behaviour, interactions, and adaptation at the single-cell level. Collaborative efforts with various institutions and new technological platforms will be essential to achieve these objectives.

Regarding the management of the unit, the major change will concern the nomination of a new director who will take over the lead of the unit.

RECOMMENDATIONS TO THE UNIT

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

- It is important that minutes of the various meetings (Codir, Core…) are drawn up and made available to all staff on the unit through the intranet. This will ensure an equitable distribution of information among all unit members.

- The welcome package to help newcomers needs to be updated.

- To smooth the transition when the team leader (or platform leader) will retire, a succession plan has been implemented in the unit at least two years before the anticipated departure (discussion between the DU with the former and the proposed next team leader, with team members, and final validation in front of the Codir). This procedure was thoughtfully planned and should be pursed. Yet, it is also important to consider an equilibrium between the pursuit of some team projects when new team leaders emerge internally and the creation of additional teams through external calls (see the point below).

- There is a strong asymmetry in the size of the teams. Alternative organisational models such as the one used by Team 13 might be explored to structure the rest of the unit. Having more homogenous smaller teams could promote agility, cohesion, and effective collaborations. However, before implementing any organisational changes, it is essential to consider the specific needs and the overall context of the team and of the unit.

- The coordinators of the thematic pillars have been nominated once and for all and a process to renew them on a regular basis (e.g. every two years) should be implemented. The implementation of transversal axes fostered new collaborative projects and this impetus should be consolidated in the future.

- The infrastructure increase of the unit with the renovated building will have a non-negligible impact on its overall budget and this point might be a matter of discussion with the funding bodies.

- The committee commends the current director on the quality of his management and wishes his successor every success in the goal to maintain Micalis at the forefront of research in microbiology.

Recommendations regarding the Evaluation Area 2: Attractiveness

The committee strongly recommend to:

- Install an international SAB to provide expert guidance and an external perspective on ideas on how to evolve the unit's organisation and how selecting and implementing strategic directions. A distinguished SAB will also enhance the organisation's international credibility and reputation.
- Create a culture of open international and external calls for recruitment of new groups at Micalis and avoid automatic internal inheritance of teams, except when the quality of young emerging scientists within the team is recognised. Foster Emergence and Visibility of Group Leaders. Enhancing the independence and visibility of group leaders will not only benefit the team but also contribute positively to the unit dynamics.

Recommendations regarding Evaluation Area 3: Scientific Production

Despite the will to reduce the use of predatory journals (i.e. MDPI), there are still some teams that disseminate their results through this type of journal so the efforts engaged by the unit to avoid publishing in such journals are strongly encouraged and should be intensified in the future. Some teams work on timely projects in line with major societal issues and they might target higher impact journals.

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

The unit strong involvement in health and societal issues, and its links with numerous companies, are a major asset of the unit, and this trend should be maintained, or even amplified if possible.

TEAM-BY-TEAM OR THEME ASSESSMENT

Team 1: Biofilms and Spatially Organised Communities (B3D)

Name of the supervisor: R Briandet

THEMES OF THE TEAM

The team's main aim is to assess the relationship between the spatial organisation of microbial communities and their properties with respect to biofilms and food-related environments. Within this framework the B3D seeks to investigate the phenotypic heterogeneity and interspecies inaction which contribute to community stability, diversity and function thereby also seeking breakthroughs in food microbiology but also other areas. To achieve these aims the team employs a comprehensive approach combining practical applications with novel cutting-edge techniques.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The main recommendations provided in the previous report comprise to base the research on clearly stated hypothesis and to use molecular tools to assess the species interactions which could be achieved by decreasing the reliance on external sources to generate recombinant strains and by recruiting accordingly skilled scientists. Moreover, it was recommended to identify specific areas that are of interest to industry and to consider possibilities for patent applications. It was also pointed out that the team should identify areas leading to publications suitable for higher impact journals and that rather than focusing on the composition of book chapters research should be published as original articles in peer-reviewed journals. Moreover, the team was encouraged to recruit more PhD students.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	2
Doctorants	7
Sous-total personnels non permanents en activité	**11**
Total personnels	**17**

EVALUATION

Overall assessment of the team

The overall assessment of the team is excellent. The team´s scientific output is very good to excellent. It has increased within the last evaluation period regarding scientific publications. Still, the number is rather low, especially in view of publications originating from the team. The team has increased its international visibility. The teams' visibility and outreach to the general public is considered excellent.

Strengths and possibilities linked to the context

The team has increased its outreach to the scientific community in France (and Europe) by leading the "Ferments du Futur" under the France 2023 public-private invitation and but also by acting as the Vice-president of the international Iseki-food association. Also, team members have been invited to evaluate organisational structures and research projects from various organisations e.g. Hcéres, ERC, ANR underlying the visibility of the team within its research field.
The team has participated in several conference organisations and has acted on scientific advisory boards. Moreover, by being invited to a radio show and by creating an educational card game aiming to help students to understand current challenges related to health, food safety and processing, the outreach and visibility in the general public were fostered.

Weaknesses and risks linked to the context

The team has successfully acquired several research funding (~1.3 M€). It seems that momentarily there are only a limited number of third parties funded research projects providing larger budgets.
The team has several original scientific manuscripts in very good to excellent journals, including Nat Comm., as leader and PNAS, in collaboration. It was encouraged in the last evaluation to interact with other groups within Micalis but also outside. By the number of publications listing other groups, it seems as if the group has increased its collaborative efforts; however, it still appears as if the number of publications originating from the group itself is still rather limited. Also, the team has a rather high teaching load compared to other teams.
Still, the route taken in 2023 with respect to publications should be pursued as this will foreseeingly also lead to acquiring additional and probably larger third-party funding (also at an international level).

Analysis of the team's trajectory

The team's trajectory is based on its foundational work focusing on deciphering variability and microbial interaction within biofilms and spatially organised communities. This is envisioned as pivotal across various applications ranging from food safety to bioengineering. In this the team includes ´omics´ data combining spatial modelling and artificial intelligence. For the near future the team plans to develop the new `Ferments du Futur PIAM´ platform and the `Cultissimeo Micalis facility´, the latter being planned to set new standards in this area of research.
As stated in the report, the team is in a phase of change with respect to personal. This has been addressed and related changes in the focus of its research will be related to the onboarding of new members, increasing the present expertise in with relation to "Unlocking the Potential of Biofilm Properties in Beneficial Microbes for one Health Advances".

RECOMMENDATIONS TO THE TEAM

It´s recommended to pursue the route taken in recent years; however, it might be beneficial to define even clearer, more focused working hypothesis (together with the new members of the team). The latter might help to overcome drawbacks related to the marked change in researchers which will probably also result in a loss of knowledge. Moreover, it is recommended to continue the route taken with publishing data; however, it is suggested to focus on research activity to publish manuscripts in journals without editorial involvement of the lead authors or journals with controversial reputation (e.g. predatory publishers).

Team 2: Pathogenic Bacteria and Health (BaPS)

Name of the supervisor: C Janoir

THEMES OF THE TEAM

Members of a previous team working on C. difficile joined the Micalis Unit in 2020. This change made it possible to refocus the team's research theme on the pathophysiological mechanisms leading to infections caused by this pathogen. Several aspects have since been developed, considering the unit's competencies, in particular the relations host – microbiota and the global aim is to develop original therapeutic strategies to prevent/cure CD infections.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The recommendations of the previous report mostly concerned the setting up of collaborations with other Micalis groups to broaden the investigations on CD and its interactions with the microbiota and beneficial bacteria. Despite difficulties encountered, in particular technical difficulties due to the relocation of the laboratory, the integration into Micalis is considered as a success.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	4
Maîtres de conférences et assimilés	8
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	5
Sous-total personnels permanents en activité	**17**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	3
Post-doctorants	0
Doctorants	2
Sous-total personnels non permanents en activité	**5**
Total personnels	**22**

EVALUATION

Overall assessment of the team

The overall assessment is very good to excellent. Despite the involvement of most team members in teaching and hospital duties, the team has regularly published in high impact microbiology journals. The team is also active in patenting, with the description of a miRNA capable of modulating the inflammatory response induced by CD, as well as an ongoing one on the beneficial impact of a probiotic strain on CD colonisation student training is very good.
Several collaborations have been set up or strengthened during the past years.
The team's efforts to acquire research funding are noteworthy.

Strengths and possibilities linked to the context

Joining the Micalis unit has obviously created a dynamic within the BaPS team, encouraging the development of new areas of the CD project (dysbiosis and microbiota, beneficial bugs). The efforts made to reduce the number of animal experiments by using natural samples are notable. Development of ex vivo models are particularly scheduled in the next contract.
The team has recently been strengthened by the hiring of two associate professors and two fixed-term contracts technical staff members (university). The interactions with the industrial world have been increased during the past years and the proximity to the medical world (team members with clinical duties) is a positive point.
Some members of the team are actively involved in the RCDF (Réseau Clostridium Difficile France) network, which aims to expand internationally.

Weaknesses and risks linked to the context

The BaPS team only included a few postdoctoral scientists during the last years. The presence of these fellows would considerably help the senior staff by developing projects and mentoring PhD students on a daily base.
Although the success rate in funding has been improved, the team should continue its efforts to obtain funding as PI. The international recognition (invitations or talks to international congress) is limited to a few people in the group; the team's international visibility could be increased by expanding this activity.

Analysis of the team's trajectory

The research themes have been previously refocused on CD infections and the four axes developed during the past years will be transformed in three lines of research, ranging from the study of gut microbiota dysbiosis and CD colonisation to the host inflammatory response. This development is perfectly coherent from a scientific point of view, and will enable to concentrate the efforts and ensure even greater coherence of the team.
A change of leader is planned, but this should not affect the team's trajectory and work.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the number of postdoctoral fellows be increased. One way to achieve this goal would be to get funding for larger and longer-term projects. The recruitment of a full-time researcher would also be a major step forward.
All these efforts should lead to publications in high-impact journals. The committee suggests that the international visibility of the team be increased (participation to conferences).

Team 3: Bacterial Communication (ComBac)

Name of the supervisor: C Delorme & V Juillard

THEMES OF THE TEAM

The research team focuses on investigating the adaptive responses of Streptococci and Lactococci bacteria within various ecosystems, including food matrices and intestinal microbiota. Their work aims to understand how these bacteria adapt to different environments and how their adaptations influence the surrounding ecosystems. The team's research encompasses both basic and applied aspects, providing a comprehensive approach to studying these microorganisms' behaviour and impact in diverse settings.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team was advised to implement strategies to enhance both the quality and quantity of their published papers and to establish a clear scientific strategy. However, it is noted that these recommendations have not been adequately addressed. Both the team's self-evaluation report and the current evaluation committee identify these areas as ongoing weaknesses. Therefore, while the team acknowledges the importance of these recommendations, there is a need for more concerted efforts to effectively address them in the future.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**7**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	1
Doctorants	1
Sous-total personnels non permanents en activité	**4**
Total personnels	**11**

EVALUATION

Overall assessment of the team

The overall performance is rated as good to very good. They have demonstrated a commitment to their research goals. Scientific output is considered good to very good. There is still room for improvement in terms of the quality and impact of these publications. Visibility within the scientific community is good. There are opportunities for enhancing their profile and influence. Engagement with the non-academic sector is excellent. They have successfully forged strong collaborations with industry and other non-academic entities, ensuring that their research will have practical applications.

Strengths and possibilities linked to the context

The team possesses a deep knowledge of the genetics, biochemistry, and physiology of industrially significant microbes, which is highly valuable to the industry. Their research projects are well aligned with the strategic objectives of Inrae, ensuring that their work contributes to broader institutional goals. Furthermore, the team demonstrates a strong involvement in technology transfer and maintains robust collaborations with industry partners. These strengths not only enhance the team's research impact but also create promising possibilities for innovation and practical applications in industrial settings.

Weaknesses and risks linked to the context

The team's visibility is currently limited to the local and national levels, which may hinder their ability to gain international recognition. Additionally, the research productivity of the team, comprising seven permanent full-time equivalents (FTEs) including one Research Director, three Research Scientists (all with HDRs), one Associate Professor, and two technicians, is very modest. This is partly due to a strategic focus on partnering and patenting activities, which, while valuable, has diluted the team's energy across multiple research projects and the creation and management of grant consortia. Furthermore, the significant investment of the co-Principal Investigator in the administrative running of the unit has likely diverted attention from core research activities. Lastly, the team's dissemination activities are minimal, which limits the broader impact and reach of their work. Addressing these areas will be crucial for enhancing the team's overall performance and mitigating potential risks.

Analysis of the team's trajectory

The team plans to concentrate on two themes instead of three, leveraging the strengths of its members and aligning well with Inrae's 2030 objectives. Both themes hold clear application potential, which is promising for future impacts. However, there is a concern about the multiplicity of project proposals, raising questions about the team's capacity to pursue these multiple lines of research with the necessary ambition and strength, given their outputs over the last two reporting periods.
This concern is further amplified by the impending human resources (HR) challenges, as several senior scientists are approaching retirement within the next five years. This HR trajectory needs to be urgently addressed and discussed with the unit management and trustees to ensure a smooth transition and maintain the team's research momentum. Effective planning and strategic decisions will be crucial to navigate these challenges and secure the team's future success.

RECOMMENDATIONS TO THE TEAM

Focus Resources: The team is invited to concentrate its resources, strengths, and energy on the key objectives of either the research and development of lentil-based fermented products or soya-based fermented products. Both projects show high potential but are still at an early Technology Readiness Level (TRL) stage and are fully aligned with Inrae's 2030 objectives.
Outsource OAS Project: The Research and Development of the OAS antihyperglycemic project, which is at a higher TRL, is encouraged to be maximally outsourced to the newly created startup. This will allow the team to dedicate more attention to the earlier-stage, high-potential projects.
Strategic Planning for Contracts: It is suggested that future contract planning be approached with a focus on limited resources, ensuring that the team's efforts are directed towards the most promising and strategically aligned opportunities.
Urgent Discussion on Trajectory: The team's trajectory, including the impending HR challenges, needs to be urgently discussed with the unit management and trustees. This dialogue is essential to address potential gaps, secure necessary support, and ensure a smooth transition that maintains the team's research momentum and impact.
By implementing these recommendations, the team can better align its efforts with its strengths and the strategic objectives of Inrae, ultimately enhancing its overall performance and impact.

Team 4: Commensalism and Pathogenesis of Enterococci (CPE)

Name of the supervisor: P Serror

THEMES OF THE TEAM

The team's research is focused on the interactions of the pathobionts Enterococcus faecalis (humans) and Enterococcus cecorum (chickens) with their respective hosts and resident microbiota and how this affects conversion to pathogenesis. Specific research directions include the development of microbiota- and phage-based approaches to boost colonisation resistance, elucidating enterococcal invasion of hepatocytes and their role in liver disease, and targeting enterococcal immune evasion by modification of cell wall glycopolymers.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous report commented on the group's low grant success rate, which should be addressed by means of institute peer review. In the current evaluation period, the team has secured several grants. However, the number of larger and longer-term grants is small with only one three-year ANR grant exceeding €200K.
In addition, the 2020 review recommended further development of the team's hepatocyte research. This has been successfully achieved with a key publication in the high-impact journal Gut microbes in 2022 and securing of further grant income for Enterococcus hepatocyte research (€130K total).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	0
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**3**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The overall assessment is very good to excellent. The team's publication record, visibility and non-academic activities are each very good to excellent. The trajectory is very relevant to human and animal health and the economy of the poultry industry and largely corresponds to the group's expertise and track record.

Strengths and possibilities linked to the context

The group is well embedded in institute and national funding programmes including coordination of the institute transversal research axis Fame "Fighting AMR: Molecular and ecological mechanisms to drive innovation", contributions to the DIM One Health 2.0 scientific committee, co-coordination of WP1 "Host/Pathogen interplay from molecular to cellular and systems responses" in the PIA France 2030 IHU Prometheus and a national culturomics platform. Despite its small size, the team has a very good to excellent publication record with most papers published in mid to high impact microbiology journals (Gut microbes, PLoS Pathogens, mBio, J Clin Microbes). Each PhD student in the group has contributed to approximately two papers and five conference presentations which is excellent. In addition, the team has a very good to excellent visibility with ten invited conference talks and a very active engagement in PhD committees. In particular, the team co-coordinated the scientific committee of the international symposium "Pathobiome 2018". Loss of three permanent staff members during the evaluation period was managed well through recruitment of non-permanent support. Engagement with non-academic activities is very good to excellent with two patents, four translational projects and participation in the European BroilerNet programme.

Weaknesses and risks linked to the context

Although the group has five members of permanent staff, only three PhD students have been supervised during the evaluation period. There is currently only one PhD student in the team and no postdocs. In addition, funding is a little low, especially for larger projects (> €200K). Given the impact of Enterococcus infections on the poultry industry, a higher amount of industry funding would be desirable. The self-evaluation reports a lack of bioinformatics staff for Omics analysis and the group aims to recruit a data scientist in 2025. This will be achieved by employing a Micalis research engineer with transversal activities or funding a postdoc together with the region of Ile-de-France and IHU Prometheus.

Analysis of the team's trajectory

The outlined future strategy is a natural extension of the group's current strengths focused on microbiota/phage therapies to enhance the mucosal barrier, hepatocytic lifestyle and immune evasion of enterococci by cell surface glycosylation. For the first research area, the team proposes an extension to other Eskape pathogens and performance of correlation analyses between microbiota composition and pathogen presence. Although this is a common approach, the project would benefit from specific focus points and hypotheses. In addition, this appears like a big project for a relatively small group, and would benefit from additional expertise and collaborations. The other two research themes are sound and build on the team's success in characterising the intracellular lifestyle of Enterococcus in hepatocytes and their track record in structural analysis of Enterococcal Polysaccharide antigens. All three themes are highly relevant to reducing the impact of enterococcal infections in humans and poultry. In 2026, the team will undergo a change of leadership. This has been well planned in advance and discussed with the group.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team increases the number of PhD students and Postdocs, and searches for funding for larger and longer-term projects. In addition, it is recommended that the links with the poultry industry be explored/extended to increase commercial funding opportunities. The committee suggests that trajectory plans on microbiota-based therapies (theme 1) be critically evaluated in terms of expertise and resources needed. While this work will benefit from the institute's Culturomics facility, bioinformatics support needs to be arranged.

Team 5: Microbial Genetics and Environment (GME)

Name of the supervisor: C. Nielsen-LeRoux & L. Slamti

THEMES OF THE TEAM

The team's objective is to understand the mechanisms underlying the pathogenic and adaptive properties of spore-forming bacteria of the Bacillus cereus group that colonise mammals and insects, as well as the enteropathogen Clostridioides difficile. Their research has applications in the fields of human health, food safety and crop protection.
The team's research activity is divided into three axes of fundamental research, to study the adaptation and persistence of the studied bacteria, the virulence and emergence of pathogenic strains and the health of insects in mass rearing. The group has also developed an applied research axis to work on finalised projects, as well as an insectarium which is the platform for their infection model.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team was recommended to publish in higher-impact journals, but this was not really achieved. A large number of publications were produced during the evaluation period (49 articles and reviews), published in a large number of different journals. Some work has been published in journals with an excellent reputation, but there are still too many publications in low-impact or controversial journals.

The main concern was that the organisation of the group needed to be improved. This point was taken into consideration. Team members were not introduced in the report through method-focused activities, but through projects in the team trajectory. The succession of the team has been organised with the two new team leaders. Furthermore, new retirements are anticipated in 2026/2028 and a refocusing of the team's activities is planned. In particular, it is planned to gradually stop research activities on the health of insects in mass rearing.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	4
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	7
Sous-total personnels permanents en activité	**13**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	1
Post-doctorants	2
Doctorants	1
Sous-total personnels non permanents en activité	**5**
Total personnels	**18**

EVALUATION

Overall assessment of the team

The overall assessment is excellent. The team's scientific output is very good to excellent with an excellent number of publications and strong leadership but too small a number of publications in highly recognised journals. The level of training through research is excellent.
The team's visibility and impact on the economy and society are excellent. The team is internationally recognised and interaction with the non-academic world is one of the team's great strengths. The group's trajectory is very relevant, even if the large number of projects increases the risk of thematic dispersion.

Strengths and possibilities linked to the context

The team's work has an impact on the environment and health (biopesticides and microbial risk in insect production). One of the team's great strengths is its interaction with the non-academic world and its impact on the economy and society. Its research devoted to transfer and innovation has been crowned with success, with three patents during the evaluation period. The team's research activity is well balanced between fundamental and applied science. The team has succeeded in obtaining funding for both fundamental and applied projects, with a high success rate both nationally (ANR, TWB, SATT) and internationally (ITN, LIA China, EU project).
The number of publications is very high, with 49 publications and reviews, and the leadership of the team is strong, with a large majority of articles (30) as the last or corresponding author. However, there are only a small number of publications in highly recognised microbiology journals. Involvement in training through research is excellent, with eleven PhD students trained and all 10 who defended their thesis had at least one published article. The team has an international leadership on Bt/Bc genetics and cell-cell communication. The team makes frequent presentations at international meetings. The international reputation is excellent, with four invitations to conferences and 34 oral presentations.

Weaknesses and risks linked to the context

Although the number of publications during the evaluation period is excellent, there are too many publications in low-impact or controversial journals.
The team has a large number of funded projects relative to its size. The risk of dispersal of research activities is therefore high, but certainly reinforced by the large number of microbial strains studied in the group (various Bc, Bt or Cd strains). It is even planned to extend this number in the trajectory with the study of other members of the B. cereus group in the persistence studies.

Analysis of the team's trajectory

The team's trajectory is a logical continuation of research activities in all the four thematic pillars of the team (adaptation, persistence and virulence of B. cereus, heterogeneity and persistence of C difficile, insect health in mass breeding, and applications of the modified B. thuringiensis strain in the vector control strategy or production of molecules of interest). The projects are numerous, some are already funded and/or organised with collaborations and they will probably have a major impact on science and society. The main risk is that the team is dispersed due to the multiplicity of projects and bacterial strains studied.

RECOMMENDATIONS TO THE TEAM

In view of the announced reduction in permanent staff, it is recommended that the team concentrate its activity in order to maintain its visibility. The team is aware of this and has planned to reduce the number of projects due to the retirements of the two principal researchers of a pillar of the activity. Work on insect health in mass rearing will be stopped in the coming years. However, this reflection must be pursued and the strategic choice of maintaining in the future research on different bacterial models of C. difficile in addition to B. cereus and B. thuringiensis must be carefully weighed.
It is also recommended that the team diminish the number of publications in journals with low-impact factors or controversial reputation (Microbiology, Research in microbiology, Frontiers, MDPI, etc.) in order to increase the impact of their research (even if a reduction in the number of publications could be the consequence).

Team 6: Epigenetics and Cellular Microbiology (Epimic)

Name of the supervisor: A Pagliuso

THEMES OF THE TEAM

The team Epimic studies the long-term impact of pathogenic bacteria on health and aims to understand the molecular basis of bacterial persistence and dormancy. The bacterial model used by the team is the facultative intracellular pathogen Listeria monocytogenes. The team's research focuses on two axes, the host-pathogen crosstalk and bacterial persistence during infection, and the bacterial persistence in the environment.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The main recommendation concerned the need to generate more external funding. This lack of funding was rectified during the evaluation period, as the group obtained significant funding through various highly competitive national (3 ANR) and international (1 ITN) calls for proposals, in addition to the support from Inrae.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	2
Doctorants	2
Sous-total personnels non permanents en activité	**6**
Total personnels	**10**

EVALUATION

Overall assessment of the team

The scientific outputs of the team's research are excellent. The publication rate and student training are excellent. The team's reputation and attractiveness are excellent, as shown by the high rate of funding in very competitive calls for proposals.
The project is in line with the results obtained and is scientifically relevant, with great potential and originality.

Strengths and possibilities linked to the context

The scientific impact of the team's research is excellent, with a total of nineteen publications, including eleven first/last author publications and several exceptional publications. In particular, the results obtained on wall-free forms of bacteria that are stable in aquatic environments are of major importance and have been recently published in an outstanding journal.

The team is very active in training young scientists, having supervised seven PhD students and ten Masters students during the evaluation period. All the PhD students have published during their time at the laboratory.
The team has developed fundamental research with original interdisciplinary approaches and has acquired a high reputation and attractiveness, as shown by the high rate of funding in highly competitive national and international calls (3 ANR, 1 ITN) and several invitations to international conferences/symposia (6).

Weaknesses and risks linked to the context

Studies on the long-term survival of pathogenic bacteria should have a major impact on health and society with a significant potential for applications (new treatments to limit recurrent infections, new strategies to eradicate persistent pathogens). However, the team had limited activity with non-academic partners (only 1 funding with SATT and no patents during the evaluation period) and public interactions with society is limited.

The group has adapted well to the sudden changes in the team's environment with the appointment of a new leader in 2022. Activities have been reorganised around a project in line with the PI's skills, focusing on persistence in the two main axes (host-pathogen crosstalk and bacterial persistence during infection, and bacterial persistence in the environment). Reflection on the organisation of the group began very early and the position of all the permanent members (2 CR and 1 IE) in these two axes, which was not yet clear in the report, was clarified at the audition.

Analysis of the team's trajectory

The project is scientifically relevant in the continuity of the results obtained. The team will continue to work on the bacterial and host factors important for the persistence of L. monocytogenes in vacuoles and on the function of InlP involved in the infection process. The team will also focus on understanding the persistence of L. monocytogenes in a dormant cell that has transiently lost its wall, which is particularly interesting and original. The new PI has chosen to focus the team's activity by limiting the work on epigenetic factors in infection. The team's project has been well scaled to the team's size and skills, and has adapted well to sudden changes in the team's environment. The team's project already benefits from financial support (2 ANR: 1 JCJC coordinated by the new PI and 1 PRC until 2025) and has every reason to succeed.

RECOMMENDATIONS TO THE TEAM

Due to the evaluation timing, the reorganisation of the team is too recent for specific recommendations to be made. As part of the team's visibility is linked to that of the former PI, it seems important to prioritise the valorisation of results (to avoid the publication queue mentioned in the report) and to intensify the new PI's participation in conferences.
Given the potential application of the team's research, it is also recommended to strengthen the team's activity with the non-academic world, which could offer new opportunities for project development.

Team 7: Determinants of Microbial Adaptation (MicrobAdapt)

Name of the supervisor: P Gaudu

THEMES OF THE TEAM

The research team focuses on investigating the interactions, adaptations, control, and antibiotic resistance of significant Firmicute pathogens, namely Staphylococcus aureus, Streptococcus agalactiae, and Campylobacter. Their work aims to understand the complex behaviours and mechanisms these bacteria employ to survive and thrive in various environments, with a particular emphasis on their resistance to antibiotics. By studying these pathogens, the team seeks to develop more effective control strategies and contribute to the broader understanding of bacterial pathogenesis and antimicrobial resistance.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In response to the previous evaluation's recommendations, the team has made significant progress. The recommendation to concentrate on successful areas to produce high-quality papers and increase visibility has been effectively addressed. The team has produced very good to excellent papers and achieved excellent visibility within the scientific community. Additionally, the challenge to define a common, realistic strategic direction for the team has been successfully overcome. The team has demonstrated productivity in focused areas over the evaluation period, indicating a clear and cohesive research strategy. Overall, the team has shown commendable responsiveness to the previous recommendations, resulting in notable improvements in their research output and visibility.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	3
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**5**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0
Post-doctorants	1
Doctorants	4
Sous-total personnels non permanents en activité	**6**
Total personnels	**11**

EVALUATION

Overall assessment of the team

Overall performance is rated as very good to excellent. The team has made notable progress in their field.
Scientific output is considered very good to excellent quantitatively but there is still room for improvement in terms of quality.
Visibility within the scientific community is excellent with a clear international dimension.
Engagement with the non-academic sector is very good and emerging links with the industry are exciting.

Strengths and possibilities linked to the context

The team's expertise in their specific research niche has led to excellent international visibility, positioning them as leaders in their field. This recognition has translated into a high success rate in acquiring funding, further bolstering their research capabilities. Additionally, the team has established very good engagement with the non-academic sector, and exciting emerging links with industry hold promising potential for technology transfer. These strengths not only enhance the team's research impact but also create exciting possibilities for innovation and practical applications in industrial settings. The team is well positioned to continue making significant contributions to their field while exploring new avenues for collaboration and impact.

Weaknesses and risks linked to the context

One notable area for improvement is the team's engagement with Early Career Researchers (ECRs). Relative to the team's size and the number of Habilitation à Diriger des Recherches (HDRs), the involvement with ECRs is low, with only five PhD students and 1.5 postdoctoral researchers for five HDRs over the evaluation period. This limited engagement may impact the team's ability to foster the next generation of researchers and expand its research capacity.
Additionally, while the team's scientific output is quantitatively considered very good to excellent, there is still room for improvement in terms of the quality of publications. Enhancing the impact and reach of their research through higher-quality publications will further bolster the team's reputation and influence.
Lastly, the team faces a significant operational challenge due to the lack of technician support. This gap may hinder the efficiency and productivity of the team's research activities, as adequate technical support is crucial for conducting experiments and maintaining laboratory operations.

Analysis of the team's trajectory

The team has successfully rationalised and balanced its project portfolio, ensuring that its current initiatives are well aligned with its strategic goals. This alignment, coupled with the team's very good to excellent resources — including both funding and workforce — positions them strongly to tackle their projects effectively.
The team's expertise in their research niche has not only led to excellent international visibility but has also contributed to a high success rate in acquiring funding. This financial stability allows the team to pursue their research objectives with confidence. Additionally, their emerging links with industry present exciting opportunities for technology transfer, further enhancing their impact and reach

RECOMMENDATIONS TO THE TEAM

To sustain and build on this positive trajectory, it is suggested that the team address some identified areas for improvement. Increasing engagement with Early Career Researchers (ECRs) will be crucial for fostering the next generation of scientists and expanding the team's research capacity. Moreover, focusing on enhancing the quality of their publications will bolster their already strong scientific output. Lastly, securing adequate technician support will ensure the smooth operation of their research activities, this shall be reviewed with the unit management.
By leveraging their strengths and addressing these areas, the team is well positioned to maintain its high standards and continue making significant contributions to their field.

Team 8: Phage Genome Dynamics (Dynphage)

Name of the supervisor: M-A Petit

THEMES OF THE TEAM

The team's main research focus is on molecular mechanisms underpinning bacteriophage genome evolution at the molecular level. In addition, they are interested in the molecular determinants of prophage induction in the gut microbiome and in phage-host interactions in virulent phages.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Regarding the recommendation to train more PhD students, this has been addressed with 4 PhD students being supervised or co-supervised by the team members.
The recommendation that the two senior scientists should rapidly defend their HDR has been addressed as two HDR were obtained in 2020 and 2021.
There is however little evidence that the recommendation to increase the team's visibility in the community (presentation of their results in international meetings), has been addressed.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**5**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**2**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The scientific production of the team is excellent with a total of 24 peer-reviewed papers, some in high-profile journals; which is commensurate with the size of the team. Their attractiveness is very good with a total of five PhD students and two Postdocs being trained. The team has very good recognition and visibility in the field of viruses in the gut microbiome and in the ecology of prophages in general. The team has been very successful in acquiring research funding to support their research. Their contribution to society is good. The general assessment of this team is very good to excellent.

Strengths and possibilities linked to the context

The resources of the team are suited to its activity. The team was composed of thirteen researchers during the period, including one research director, two permanent researchers, two engineers, a technician, two Post Docs and five PhD students. One permanent researcher moved in 2021 and a new researcher will join the group in 2024. They have also participated in master courses at UP Saclay.

Team members have acted as reviewers for international funding agencies in Ireland, Israel and Croatia, as well as evaluating ERC grants. The team participated in the phage.fr network which received Francois Sommer "Homme Nature" Prize in 2018. The team has trained two postdocs and four PhD students during the period. Two senior researchers have obtained their HDRs.
The team has been very successful in obtaining 850K€ in funding during the period, involving a total of four grants, of which three involved participating as coordinator. They have recently obtained an industry grant totalling 316K which will end in 2026. The team have made important contributions to their field of research particularly with respect to the potential impact of temperate phages on the gut microbiome.
The scientific production of the team is excellent with a total of 24 publications, including papers in high-profile journals such as Henrot et al., Molecular Microbiology and Shah et al., 2023 Nature Microbiology. Moreover 9 of these publications, bear the signature of a PhD student in the group, with 8 having a PhD as the first author.
There is clear evidence of collaboration with other teams in the unit through joint publications and training of PhD students and postdoctoral researchers.
There is also evidence of collaboration with international groups, particularly with groups in Canada and Denmark. Members of the team were involved in sharing knowledge with the general public through public broadcasts such as the "La méthode scientifique", and "Autour de la question" and through press releases. A team member has also participated in round table events on biodiversity in the area of phages in the gut microbiome. There is a very good level of interaction with industry, involving MaaT Pharma and Phaxiam.

Weaknesses and risks linked to the context

There is limited evidence of invitations to the team to present their work at academic institutions and international congresses, with only one invitation to a team member to present at an international phage conference. There is also limited evidence of the team being involved in the organisation of either national or international congresses; although the team are attempting to establish collaborative linkages with the national and international research groups. While there is some evidence of public outreach activities, these are somewhat limited, which is somewhat surprising given the public interest in phage-related issues surrounding the gut microbiome and in their potential use in combating antibiotic resistance.

Analysis of the team's trajectory

The team will continue to focus on studying the ecology of prophages and their lysogen hosts in different environments. They plan to collaborate with the NutriPhage team and expand their work to animal models. They also plan to study the potential role that phages may play in gut microbiome imbalances and restoration. This work will be implemented by the Charge de Researcher who will be recruited.
The second aspect of the team's work will involve the study of virulent phages with a focus on phage host interactions in animal models and on their interactions with the host gut microbiome. They plan to employ their expertise with the E. faecium infecting phage Porthos together with a Crispr-based approach to target the infection in a larger number of clinical strains. This will involve a collaboration with the B3D group. They will also study recombinases with a view to modifying phage host range in a collaboration with the Debarbieux group at Pasteur.
These projects are very interesting as well as being technically challenging and highly ambitious for the team and will require them to leverage the expertise afforded to them in the aforementioned collaborative linkages.

RECOMMENDATIONS TO THE TEAM

The team needs to increase its overall visibility both nationally and internationally.
This should be possible through their membership of the phage.fr network and by building on the European twinning project Asclepius.
The team needs to further increase its interaction with industry, which should be possible due to the applied aspects of their work.
The team needs to increase its activities in the society domain, which will ultimately help to increase their overall visibility both locally and nationally.

Team 9: Pathogens, Immunity and Microbiota (PIMs)

Name of the supervisor: N Rama Rao

THEMES OF THE TEAM

The team studies the virulence of pathogens and, more specifically, the resistance of bacteria to the host immune system. The team's work focuses on three axes. The first is the study of the effects of the immune response on pathogenic bacteria (from the Eskape group) and the second on pathogen/host/microbiota interactions. The third is the development of new anti-virulence strategies to combat bacterial infections.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has followed the main recommendation of the last evaluation committee, which was to increase the group's visibility.
In order to increase the group's visibility, the team's website has been improved. Several collaborations (ANSES, CEA, Institut Galien, MAiage or MEDIS units and other Micalis Phylhom and Probihôte teams) were listed in the documents provided for the evaluation, indicating an active collaboration network. The team's visibility has been enhanced, as shown by its high funding success rate, with several funded projects (9) and 5 doctoral grants during the evaluation period. The team has also explored opportunities for engagement with industry through several projects with non-academic partners (e.g. TWB industrial demonstrator, maturation projects with SAAT or Mecenat (AXA)).

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	0
Sous-total personnels permanents en activité	**1**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	1
Doctorants	3
Sous-total personnels non permanents en activité	**5**
Total personnels	**6**

EVALUATION

Overall assessment of the team

The overall assessment is excellent. The group's production is very good to excellent, with a high publication rate given the small size of the team, but the impact of publication could be increased. The level of training through research with several supervised docs and postdocs is excellent. The success rate in terms of funding and interaction with the non-academic partners is excellent. The group's trajectory on translational research on the development of new anti-virulence strategies to combat bacterial infections is highly relevant and everything is in place to succeed.

Strengths and possibilities linked to the context

The group has a high publication rate (12 publications and 4 reviews) given the small size of the team (1 DR). It is attractive and well managed, with a high number (8) of PhD students and postdocs recruited during the evaluation period, all of whom have published during their time at the laboratory.
The group has acquired a high national visibility with ANR grants (2024-2027) and French Mécénat Funding in coordination and is also recognised at international level with PHC France-Germany, a 2-year mission of the PI in Germany (U. Tubingen) and participation to two EU2020 projects.
The study of the bacterial resistance to the host immune system is both scientifically and socially relevant. The activity of the group is well balanced between academic and finalised projects (demonstrator TWB, maturation projects (SAAT, POCs in LAB) + Mecenat (AXA) and 1 patent in 2020). Science and society are at the heart of the group's activities, with numerous public interactions (production of games, comic strips and several communications).

Weaknesses and risks linked to the context

The number of publications/reviews (15) during the evaluation period is very high given the small size of the team, but too many publications were in controversial open access journals (6 articles in MDPI journals). Although the group has important recognition, participation in conferences appears to be low (1 international conference in 2021 and 3 posters) in relation to the quantity of work published.
The major problem is the small size of the team. The risk for the PI is work overload, with a high number of PhD students and postdocs without permanent technical support and an increasing number of funded projects.

Analysis of the team's trajectory

The group's trajectory is focused on translational research and concerns the axis of the group's activity on the development of new anti-virulence strategies to combat bacterial infections.
The project is a continuation of previous research activities on Mfd inhibitors. The team plans to build on these results to develop effective leads ready for preclinical trials. It includes translational aspects and has the potential to engage with industry and to have an impact on clinical practice. Appropriate collaborations with national collaborators (Maiage /CEA/Institut Galien) should ensure the success of the proposed work. The project is already funded by the ANR and Axa-Mecenat. A Start-up creation (DrugInnov) is in discussion.
No perspective on the other two axes, concerning the effects of the immune response on pathogenic bacteria and Host/Pathogen/Microbiota interactions, have been developed in the trajectory.

RECOMMENDATIONS TO THE TEAM

The group's research theme is scientifically relevant and has an impact on society. With funding secured, it is recommended that the team efforts be devoted more specifically to improving the group's visibility by increasing the level of publications and participation in conferences.
The main limitation of the group is its size. The group has chosen to concentrate its activity on the development of new anti-virulence strategies to combat bacterial infections and will reduce its activity in the other two research axes. However, the involvement of the PI in the development of the start-up DrugInnov will have to be carefully weighed up to ensure the continuity of the team's activity. In this context, permanent recruitment over the next few years is crucial.

Team 10: Bacterial Cell Wall Dynamics (Paroi)

Name of the supervisor: M-P Chapot-Chartier

THEMES OF THE TEAM

The domain of the team is the study of the dynamics of the bacterial cell wall of Gram-positive beneficial bacteria from food or gut microbiota. Their aim is to understand how the cell wall dynamics shape the properties of these bacteria, such as their growth and resistance to stress, their sensitivity to bacteriophages in food ecosystems and their ability to interact with their host cells.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team was recommended to provide strategies to increase the number of personnel, to attract postdocs and PhD students. This has worked out nicely as there are several PhD- students and postdocs active.

It was also recommended to focus on funding strategies, including ones with companies. The team has managed to secure funding for several projects relevant to their work field, some smaller some bigger.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**5**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	0
Sous-total personnels non permanents en activité	**1**
Total personnels	**6**

EVALUATION

Overall assessment of the team

The overall assessment is very good to excellent. The team is publishing consistently, both in terms of the number of papers published as well as the quality of these papers with strong leadership. The team is well placed and recognised, both nationally and internationally. Their science is strong. However, the team is still small. There was training of one PhD student, but several students are still on projects. However, it seems that most PhD students and postdocs will finish on a short term and maybe there will be a gap again in team size. The team's visibility and impact on the economy and society are excellent as the team has both patents and contracts with industry. The group's trajectory is very relevant but as indicates with two retirements coming up it is recommended to think is new themes should be started that will fit to the expertise of their successors.

Strengths and possibilities linked to the context

The team has a unique expertise and conducts projects that are both fundamental and applied. Their output on the project is very good to excellent. Their projects will run up until 2025. Their achievements in terms of the number and quality of publications are very good with strong leadership. One PhD defended its thesis with published articles.
The team is International active with long-lasting collaboration and presentations at international meetings.

Weaknesses and risks linked to the context

The team recognises that the upcoming retirements will influence the team size and scope. The team has actively searched for successors but this has not yet been successful. It is not clear if there will be additional funds after 2025 to recruit new PhD students. Most projects seem to end in the near future.

Analysis of the team's trajectory

The projects are focused and relevant with a unique expertise. The group has good collaborations to guarantee complementary finding. The impact on science and society is relevant and possible due to possible applications in food and health. The team has increased in size but it is not clear if the current size will be continued due to the ending of contracts and projects. The team will continue working on very similar projects. Since the laboratory is well placed in the field, this seems a logical and understandable strategy. However, it is not clear if this will work if there will be successors of the upcoming retirement. The team is well aware of the changes that are needed to be made with the upcoming retirement of two senior scientists.

RECOMMENDATIONS TO THE TEAM

It is recommended to develop a vision of the team strategy and scientific scope for the coming years. When new people will be attracted, they should fit in the research project but also be able to develop new projects within their personal field of expertise. It is also recommended to think of a structure to attract excellent new people.

Team 11: Food Microbial Ecology (FME)

Name of the supervisor: M-C Champomier-Vergès et S Chaillou

THEMES OF THE TEAM

The team is mainly interested in gaining an understanding of the mechanisms by which bacteria interact with food during spoilage and fermentation. They are aiming to understand how food microbial diversity may be leveraged to design microbial solutions for more sustainable and healthy fermented food production. To this end they are focusing on the food microbiome within the food chain, functionally analysing food microbial metabolic interactions and attempting to develop synthetic ecology methodology.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The recommendation on scientific production has to some extent been addressed, but still needs to be improved.
The recommendation regarding the acquisition of competitive funding to obtain a better international recognition has been addressed.
The recommendations on the scientific strategy and projects, particularly with respect to
moving their research from descriptive to more hypothesis-driven approach, have largely not been addressed, but there is some evidence in the more recent projects that have been funded that this may be addressed in the future.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	3
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**7**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	4
Post-doctorants	1
Doctorants	1
Sous-total personnels non permanents en activité	**7**
Total personnels	**14**

EVALUATION

Overall assessment of the team

The scientific production of the team is very good with a total of 46 publications including 32 peer-reviewed publications. Their attractiveness is also very good with international visibility in the field of food microbial ecology. However, their track record in training PhD students is quite poor. The team's track record in acquiring research funding to support their research is however excellent. Their contribution to society is excellent and is reflected in the team's involvement with a variety of public outreach activities. The general assessment of this team is very good.

Strengths and possibilities linked to the context

The team was composed of five senior researchers, with 4 having HDR during the reporting period, together with two IRs funded from external sources. Three PhD students were supervised or co-supervised and three postdoctoral researchers were present at different periods, with one postdoctoral fellow currently employed. One researcher moved in 2020 and a junior researcher joined the group in 2022.
The visibility of the team is very good with team members being involved in the organisation of a scientific session on food microbial ecology at the ISME18 conference in Lausanne in 2020 and having presented an invited talk. They have also co-organised a session at the 37th EFFoST in Valencia in 2023. The FME team coordinates some of the Master courses in the Biosphera graduate school, together with teaching engineers and master students for around 350 hours at Paris Saclay University. The team has a modest record of PhD supervision having trained three PhD students during the period and hosted two others for short periods of time.
The team has been very successful in acquiring research funding, having secured a total of twelve grants totalling over 2.4M€, eight of which were coordinated either by team members. The funding sources were from a variety of sources including ANR, Inrae (internal) and from industrial sources. The team's coordination of the Horizon Europe "Domino" project is a particular highlight.
The team have made important contributions to their field of research, having highlighted the potential role that ecological networks may play in helping to understand food quality.

The scientific production of the team is very good with a total of 46 publications, including; 32 papers, eleven review articles and three book chapters. This is commensurate with the size of the team (5 senior scientists). The majority of these papers appear in very relevant specialised journals in the area. Moreover, nineteen of these publications, bear the signature of PhD students or postdoctoral researchers in the group, with fifteen of the articles involving international collaborators.
The team have excellent ongoing collaborative linkages with industry, as evidenced by their grant capture from industrial sources. They are involved in citizen science activities such as for example the living labs as part of the Domino project. They have a high visibility in the fermented foods area being involved in seminars, podcasts and exhibitions which highlight their work. One of the team leaders is a member of the steering committee in developing the Grand Challenge (GDFF) on fermented foods (2018-2023). The team together with other teams from Micalis is also involved in the "Ferments du Future" an Inrae distributed infrastructure, part of which involves public education activities.

Weaknesses and risks linked to the context

The resources of this team are not particularly well suited to their activities. The team lacks full-time technical support for experimental lab work, which in the long term may potentially negatively impact the scientific production of the team.
The team has a poor record in training PhD students, with only two PhD students trained during the period, despite the fact that four of the PIs have HDRs. In addition, the number of post-doctoral researchers in the group is not commensurate with the number of PIs.
The team is currently publishing most of its research outputs in specialised journals, which although appropriate to the field, lack the visibility required to disseminate their work to the broader scientific community and to increase their international visibility.
While there is evidence of involvement in international congresses, there is little evidence of invitations to present work in academic institutions or national or international congresses by team members.
As highlighted by the team itself, they lack any activity in the area of the protection of intellectual property.

Analysis of the team's trajectory

The team plans to leverage its current knowledge of food and human gut microbiomes to focus on the design of microbial consortia to advance the field of how food microbiota interacts with human digestive health. They will focus on community structuring, with a view to determining the impact of microbial diversity in functional population dynamics. In particular they plan to study the role of spatial structuring of communities in solid or semi-solid foods and the influence of metabolites on growth. In addition, synthetic microbial ecology will be used to study the interactions between the food matrix and various microbial strains in the context of sustainable food systems.
While the team refers to recently funded projects and the establishment of the PIAM Platform to facilitate the work together with development of computational tools and databases, little specific detail is provided regarding the systems that will be explored and the hypothesis that will be tested.

RECOMMENDATIONS TO THE TEAM

The team is encouraged to explore the possibility of recruiting a full-time technician, to support the scientific production of the team.
The team is also encouraged to increase the number of PhD students that it trains. They should use the opportunity of their position as teachers in the Master's programs at University Paris Saclay to highlight their research activity and attract students. They should also increase the number of post-doctoral researchers in the group.
The team is currently publishing most of its research outputs in specialised journals, which although appropriate to the field, lack the visibility required to disseminate their work to the broader scientific community and to increase their international visibility. Thus, they are recommended to target higher-profile publications in future, when appropriate.
The team is encouraged to explore the possibility of generating and protecting the intellectual property associated with their ongoing and in particular their future work.

Team 12: Diet, Intestinal Microbiota, Brain and Metabolic Diseases (AMIPEM)

Name of the supervisor: P Gérard

THEMES OF THE TEAM

The team's research is focused on the influence of the microbiota and diet on human health. Specific directions include the role of the microbiota in non-alcoholic fatty liver disease, the effect of a Western diet and sugars on the microbiota and host (e.g. obesity, IBS), and microbiota gut-brain axis interactions in autism.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous report recommended focusing the group's research directions to fewer themes and improving the interaction of all team members by defining common research goals. This does not appear to have been addressed during the recent evaluation period, but is planned in the trajectory: Due to retirement and leave of two staff members in the gut-brain axis theme, this research area will likely come to a close. Instead, the recent appointment of an immunologist will open opportunities for wider projects related to interactions between diet, the microbiota and inflammation, thereby unifying the team's expertise in nutrition, microbiology and immunology. In addition, the team has been advised to develop collaborations with clinicians to harness the translational aspects of their research. This has been achieved with several national and international hospital collaborations.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	4
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**8**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	1
Doctorants	0
Sous-total personnels non permanents en activité	**2**
Total personnels	**10**

EVALUATION

Overall assessment of the team

The overall assessment is very good to excellent. The group has excellent visibility evidenced by international collaborations, conference invitations and participation in committees. In addition, their non-academic output is excellent with successful industry funding and licensing of patents. The publication record is very good with a high number of publications, but the impact could be increased. The group's trajectory on diet-microbiota-immune response interactions is highly relevant to public health and should foster collaboration within the team, lead to high-impact publications and generate further funding.

Strengths and possibilities linked to the context

The team has excellent international collaborations and contact with industry and clinicians. This is largely based on their strong expertise in gnotobiotic mice and microbiota transplantation. Their excellent reputation is evidenced by frequent conference talk invitations and participation in nutrition and microbiota-themed committees. During the evaluation period, the team secured considerable external funding, in particular three ANR grants in 2023 and a total of 650 k€ funding from the European Union. In addition, support from industry partners is evident and a recent patent license has led to the foundation of a start-up company. The group is highly involved in the training of master students and has educated seven PhD students during the evaluation period. Contributions to public outreach activities are excellent.

Weaknesses and risks linked to the context

Although the group encompasses several permanent staff members, there were no PhD students or equivalent evidence of training of early career researchers at the end of the reporting period. However, the group has since acquired funding for two PhDs and two postdoc positions starting in 2024. Although the group has produced numerous papers, many are published in journals with less rigorous peer review (eg MDPI, Frontiers).

Analysis of the team's trajectory

The future direction of the team is very much determined by the three recently awarded ANR grants (one as PI, 2 as Co-I) and focus on the role of microbiota in fructose malabsorption in IBS, the influence of the microbiota on intestinal fibrosis and the application of lactic acid bacteria and milk lipids to restore microbiota functionality in metabolic disease. Although the self-evaluation report did not outline any plans to continue previous research themes on the role of the microbiota on liver and neurological disease, one PhD and one postdoc position on the impact of the microbiota in autism have been secured in 2024. In addition, the team's expertise on nutrition and microbiology is complemented by a new staff member with expertise in immunology. The outlined trajectory is likely to focus the group's research direction and foster collaboration between team members.

RECOMMENDATIONS TO THE TEAM

The committee encourages the team to continue the education of early career researchers and recruit PhD students and postdocs.
The committee recommends that the team take care to provide sufficient supervision for the newly recruited PhD student and postdoc in the autism theme despite the impending leave of the two central staff members in this area.
The committee suggests that the team fosters an enhanced collaboration of team members and sharing/complementation of expertise which will likely lead to more publications in high-impact journals.

Team 13: Interactions of Commensal and Probiotics Microorganisms with the Host (Probihôte)

Name of the supervisor: P Langella

THEMES OF THE TEAM

The research team, comprising approximately 60 members, is dedicated to investigating Nutrition-Host-Microbiome interactions in both health and disease contexts. Their work primarily focuses on analysing the interactions of commensal and probiotic microorganisms with the host under physiological and pathophysiological conditions. By exploring these complex interplays, the team aims to uncover the mechanisms by which these microorganisms influence host health and contribute to disease states. This comprehensive approach allows the team to address critical questions in the field of microbiome research and its implications for human health.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In response to the previous evaluation's recommendations, the team has made notable progress in some areas while facing challenges in others.
Regarding the recommendation to "internationalise funding resources", the team partly benefits from a prestigious ERC Consolidator Grant awarded to a PI who leads both a group of Team 13 and a team at Inserm CRSA. There was also the renewal of LIA BactInflam for 5 years (co-directed by the team) and a new CAPES COFECUB program. Although, the majority of the team's resources remain national, sourced from both public and private funds, these national resources are outstanding in terms of their level and impact, ensuring the team's financial stability and research productivity.
The recommendation to "reduce the heterogeneity of projects and groups to minimise dispersal" has not been adequately addressed. In fact, the team has expanded its project portfolio and its size, potentially leading to further dispersal of efforts and resources. This aspect requires attention to ensure focused and cohesive research endeavours.
Concerning the recommendation to "improve scientific interaction with other Micalis teams," the progress is not clearly documented in the team's self-evaluation report. However, during the committee visit, it became evident that the team has effectively engaged in collaborative work with approximately half of the Micalis teams. This interaction is a positive step towards enhancing synergy and collaboration within the broader research unit.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	2
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	5
Chargés de recherche et assimilés	5
Personnels d'appui à la recherche	11
Sous-total personnels permanents en activité	**23**
Enseignants-chercheurs et chercheurs non permanents et assimilés	9
Personnels d'appui non permanents	8
Post-doctorants	7
Doctorants	11
Sous-total personnels non permanents en activité	**35**
Total personnels	**58**

EVALUATION

Overall assessment of the team

Overall performance is rated as excellent to outstanding. Scientific output is considered excellent based on the multiple highly visible publications that have significantly contributed to their field. Visibility within the scientific community is excellent to outstanding with a clear international dimension reflecting their prominent role in global research. Engagement with the non-academic sector is outstanding with strong collaborations with the industries and successful start-ups demonstrating their ability to translate research into practical applications and innovations.

Strengths and possibilities linked to the context

The team holds a leadership position in their research field, which is further bolstered by strong links with industry. These industry collaborations not only enhance the team's research impact but also create avenues for technology transfer and innovation. The team's critical size — comprising approximately 60 members — provides several strategic advantages. This size allows the team to buffer funding fluctuations, ensuring stability and continuity in their research endeavours. It also facilitates the emergence of new projects and support young Principal Investigators (PIs), fostering a dynamic and innovative research environment. Moreover, the team's size promotes internal collaborations and the sharing of resources and expertise, creating a local synergistic ecosystem that drives scientific progress. The team's internal and external (to the unit) attractiveness is another significant strength. Their outstanding visibility and reputation make them a magnet for talent, further enhancing their research capabilities and fostering new collaborations. This attractiveness also contributes to the team's ability to secure competitive funding and establish productive partnerships with other leading research institutions and industries.

Weaknesses and risks linked to the context

One of the primary concerns is the team's size and the potential dispersal of efforts. The team has experienced significant growth since 2018, expanding from seventeen permanent members to 23 expected permanent members by 2024. This growth has resulted in the team becoming the largest within the unit, with a substantial number of permanent staff, including five Research Directors, one University Professor-Hospital Practitioner, five Research Scientists, four Engineers, and seven Technical and Administrative staff. The team is organised into four groups and two platforms, which may be reaching the limits of viable size.
This large structure, compared to the relatively smaller size of other Micalis teams, creates a sense of asymmetry within the unit. The team's significant size and resource requirements may inadvertently create a "strong gravity effect" potentially depleting other teams of the unit of essential resources. This imbalance could lead to tension and competition within the unit, affecting overall harmony and collaboration.
Moreover, the team's continuous growth and the addition of new members and projects may result in the dispersal of efforts and resources, diluting the focus and impact of their research. Effective management and strategic planning will be crucial to mitigate these risks and ensure that the team's size and structure do not hinder their productivity and innovation. Addressing these challenges will be essential for the team to maintain its leadership position and continue delivering outstanding research outcomes.

Analysis of the team's trajectory

It is evident that the team plans to maintain its current direction, as no significant changes have been proposed. While the team's outputs are currently excellent to outstanding, there are valid concerns about the long-term sustainability and effectiveness of this approach. The proposed change in team leadership is a notable development, but it is important to recognise that the underlying structure of the team — with its multiple groups and platforms — will remain unchanged. This continuity raises several key points for consideration.
Firstly, the asymmetry within the unit, where this team is significantly larger and more resource-intensive than others, will persist. This imbalance could potentially deplete other teams of essential resources and affecting overall unit cohesion. Secondly, the dispersal of projects internally may lead to a dilution of focus and impact, despite the team's outstanding productivity. To address these potential challenges, it is crucial that the team's structure and trajectory be openly discussed and reviewed with the unit management and trustees. This dialogue will be essential to ensure that the team's size and organisation do not inadvertently hinder the unit's overall success and that the team continues to thrive in a balanced and collaborative research environment. By proactively addressing these issues, the team can maintain its leadership position and continue to deliver high-impact research outcomes.

RECOMMENDATIONS TO THE TEAM

Review Team Size and Structure. While the team's size has contributed to its excellent to outstanding research activities, it is reaching the limits of viable size. It is recommended to assess the added value of the team size in relation to the independence of group Principal Investigators (PIs) and the dynamics within the unit, particularly concerning the unit's "pôles" and "transversal axis" structuration.
Foster Emergence and Visibility of Group Leaders. Implement a strategy in collaboration with unit management to support the emergence and foster the visibility of group leaders within or outside the team. This can be achieved by providing dedicated resources, mentoring opportunities, and clear pathways for career advancement.
Open Dialogue with Unit Management. Engage in open discussions with unit management and trustees to address the potential challenges arising from the team's size and structure. This dialogue can aim to find a balance between maintaining the team's excellent research outputs and ensuring a harmonious and collaborative research environment within the unit.
Maintain Research Excellence. Continue to build on the team's track record of excellent to outstanding research activities. Encourage innovation, foster collaborations, and secure competitive funding to maintain the team's leadership position in their research field.

Team 14: Chemical and Synthetic Biology (Chemsybio)

Name of the supervisor: O Berteau & A Benjdia

THEMES OF THE TEAM

The Chemsybio team focuses on exploring the essential roles of a superfamily of enzymes from the human microbiome, the radical SAM (s-adenosyl-L-methionine) enzymes. They identified these enzymes as key players in processes ranging from host colonisation to the synthesis of bioactive molecules, notably antibiotics. The team seeks to uncover at the molecular level the functions, the mechanisms, and protein structures of these enzymes.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"The team should continue its excellent and highly visible work."
This has been successfully achieved by the team during the period under evaluation

"Opening new avenues in Synthetic Biology is highly recommended, both internally (within the institute) and externally with both national and international teams."
The team has pioneered the discovery of antibiotics and the biosynthetic enzymes thereof. They have developed a strong network of collaborators both nationally (e.g. Université Paris-Saclay, Inserm (Nordic), Synchrotron Soleil, ICSN, BIP, IBS…) and internationally (e.g. Univ. of California, Univ. Dresde, Univ. Kent, Indian Institute of Science Education and Research).

"The team should reinforce its pool of permanent researchers to secure its actual strength and visibility, possibly looking at CRCN positions with different French research institutions."
A permanent scientist position from Inrae has been opened in 2024 in the team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	2
Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	**5**
Total personnels	**9**

EVALUATION

Overall assessment of the team

This is an outstanding team at the forefront of research in the field of microbial enzymes from the microbiota, especially those using a radical s-adenosyl-L-methionine moiety and involved in antibiotic synthesis. The scientific production is outstanding for a team of such a small size and the funding is outstanding as well. The interaction with the socio-economic world is excellent.

Strengths and possibilities linked to the context

Based on their initial discovery of a new family of antibiotics, dubbed Epipeptides, team members have now unravelled the key steps of their biosynthesis. Also, they uncover the crucial role of radical SAM enzymes in the production of another antibiotic from human microbiota, the Ruminococcin C. Overall, their findings showcased the critical role of radical SAM enzymes in the biosynthesis of "ribosomally synthesised and post-translationally modified peptides" (RiPPs), offering new insights into these enzymes' mechanisms. Additionally, they have pioneered the study of a new class of B12-dependent radical SAM enzymes and have solved the first crystal structure of a member of this family, opening new research avenues in this uncharted field.
The team has gained a huge visibility in the field of radical SAM enzymes.
Its results are published in high-impact journals and among the ten selected publications, seven are with corresponding authorship: J. Am. Chem. Soc. (2018 and 2024); J. Biol. Chem. (2019 and 2020); Nat. Chem. Biol. (2024); Chemistry (2022); Nature (2022). Other publications as collaborators are: Microb. Physiol. (2021); Org. Lett. (2020); Front. Microbiol. (2020), plus three reviews including one in Curr. Opin. Struct. Biol. (2023) and one J. Biol. Chem. (2018) and one patent was deposited which was licensed to a company.
The team welcomed four PhD students and seven postdocs. The funding is also outstanding with one ERC consolidator grant plus two ERC Proof of Concept grant, one Idex project led by Université Paris-Saclay, one Industrial grant (440 k€), one labex grant, seven ANR-supported projects including four as coordinators.

Weaknesses and risks linked to the context

Although one position for a research scientist should be opened by Inrae, there are currently only two permanent members of the team, the two co-PI.

Analysis of the team's trajectory

The team will essentially pursue its research in line with its expertise, but they will also include additional uncharted enzymes in their studies. Expanding on applications is another focus area that the team will pursue in the next term, which is an exciting prospect for the future.

RECOMMENDATIONS TO THE TEAM

The committee recommends that the team maintain the same level of excellence in their work. Somehow, it is surprising that they do not benefit from more technical help from the unit. This is an issue that possibly needs to be addressed during the next contract.

Team 15: Microbiota Interactions with Human and Animal (MIHA)

Name of the supervisor: E Maguin & M Rhimi

THEMES OF THE TEAM

The MIHA team is focused on gut disease, especially IBD (or IBS) and the role of gut microbiota in proteolytic homoeostasis by modulating (e.g. exacerbating) the inflammation process. This could potentially lead to new therapeutic targets.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

"The team should maintain the same quality of activities, including PhD and Master training. The inclusion of more permanent staff and postdocs could lead to an increased international impact."
Four postdocs were recruited over the period under evaluation and the team has three permanent staff with technical duties (2 AI, one recruited in 2023 + 1 tech.). The team also hosted two teacher/researchers from Oniris.

"The team is encouraged to focus on the cutting-edge serpins topic and to collaborate more closely with other teams within Micalis such as team 13 in the other research axis. Notably, it could be interesting to collaborate more strongly with the Micalis Amipen team in the obesity-cholesterol area, which would be beneficial for the two teams. New international collaborations could be interesting."
the team co-coordinated several ongoing European projects (MicAfrica, MicrobiomeSupport and IHMCSA) over the period.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	2
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**5**
Enseignants-chercheurs et chercheurs non permanents et assimilés	2
Personnels d'appui non permanents	0
Post-doctorants	4
Doctorants	2
Sous-total personnels non permanents en activité	**8**
Total personnels	**13**

EVALUATION

Overall assessment of the team

The overall assessment of the team is very good to excellent and this team has been particularly successful to raise funds. The scientific publications are very good but less predatory journals should be targeted as well as higher impact journals. The link to societal issues is considered as excellent to outstanding with one patent deposited and four contracts with industrial partners.

Strengths and possibilities linked to the context

Many papers have been published (32 research articles, plus 19 reviews) so the scientific publication is overall very good. The visibility/attractiveness is excellent both at the national and international level: one member of Scientific Advisory Board: APC-Microbiome Ireland (since 2020, Chair since 2022), Unlock project (since 2022), European Project SIMBA (2018-23). One team leader coordinated a PEPR program.
The team has been extremely successful in raising funds: sixteen grants obtained over the period. For a total of> 3.4 M€, often as coordinator, including three Horizon2020 grants (as coordinators) and three ANR including one as coordinator. Three grants were also obtained from companies. Four PhDs thesis were defended and two are ongoing and there were (are) four postdocs in the team.
The team was also involved in teaching activities. It helped to establish two Master's programs at Paris-Saclay University, with around 130 h of teaching, mentoring, and management, and a human medicine program at Sfax University, launching in 2024. They also delivered approximately 50 hours of lectures on human metagenomics to bachelor's and master's students
Contribution of the team to society is excellent to outstanding, with interaction with four companies including three major contracts plus one Cifre PhD. One patent was deposited.
The two team leaders are also in charge of the Gut-on-chip Core Facility.

Weaknesses and risks linked to the context

Although many papers have been published, it is often in what is considered as predatory journals (i.e. 3 out of 11 selected papers were in MDPI journals).

Analysis of the team's trajectory

The projects are in line with the current expertise of the team and they will follow three main axes: (i) The variability of protease activities that will be used to categorise patients; (ii) The mode of action of bacterial Serine-Proteases and Serpins in IBD; and (iii) How food diet can modulate proteolytic homoeostasis.

RECOMMENDATIONS TO THE TEAM

Given the huge success of this team to raise funding, it should avoid predatory journal and target higher impact ones especially with a thematic centred on IBD.

Team 16: Phylogeny and Physiology of the Human Microbiome (PhylHom)

Name of the supervisor: P Lepage

THEMES OF THE TEAM

The team conducts research in the field of the human microbiome in relation to nutrition, exposome, and health disorders. They aim to understand the microbial involvement in variable contexts such as early life, cancer and IBD. The team also works on analytical pipelines.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team was recommended to increase the publication level. The team has managed over the past period to have a very good output of manuscripts with high quality level and good leading contributions.

The team was recommended to try to join the EU financed international consortia and to developing collaborations with the industry. The team has an impressive funding portfolio and has established funded collaborations with international partners including an ANR-funded project with Norway (Norwegian University of Science and Technology), a PHRC-funded project with Netherlands (Amsterdam UMC) and Israël (Tel Aviv Medical Center), and a Transatlantic grant-funded project with USA (University of Arizona, College of Medicine). There is a clear connection with the industry.

The committee also recommended structuring of the project by adding milestones that will help to control its feasibility and monitor its advancement. The themes of the team are clearly described and numbered in the current document.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**~~3~~**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	**4**
Total personnels	**7**

EVALUATION

Overall assessment of the team

The overall assessment is very good to excellent. The team has a lot of expertise in different relevant fields and very strong science. The publications level is very good in terms of the number of papers published as well as the quality of these papers with strong leadership.
The team trained five PhD students, and five PhD students are still on projects. The team members also provide courses on master level. The team's visibility and impact on the economy and society are excellent mostly in the direction of medical science. It appears to have very good connections with medical professionals.
The group's trajectory is very ambitious, the expertise for the proposed trajectories (syncoms, Ai-models) still need to be benchmarked or developed. This could be a high risk and better to also relay on current expertise.

Strengths and possibilities linked to the context

Over the past period, the team has developed an impressive portfolio in terms of funding and publications**.** The team's work has a great impact on medical and microbiome science, touching upon several relevant medical topics, such as IBD and cancer. The teams' trajectory is ambitious and very relevant within the microbiome field. They aim for translational research and thus a high societal impact is expected when successful.

Weaknesses and risks linked to the context

The proposed projects for the future are ambitious and the expertise to do such research is challenging and collaboration need to be sought or new experts should be recruited for it.

Analysis of the team's trajectory

The group's trajectory is clear and well-structured and formulated. It is ambitious with many different expertise and projects. There is a clear strategy for resources from funding and collaborations to make it happen.

RECOMMENDATIONS TO THE TEAM

It is recommended to work on an international level and to collaborate with international experts.
It is also recommended to make a supervision strategy as the team has a moderate size with many different expertise.

Team 17: Functionality of the Intestinal Ecosystem (Fine)

Name of the supervisor: N Lapaque

THEMES OF THE TEAM

The team Fine has defined the enhancement of the current understanding of the role and the interplay of microbiota in and with human health as its main focus. Herein the main object of the team lays in a better understanding of the mechanisms underlying the human-microbe symbiosis and measures to influence and modulated this through nutrition and herein specifically fibres, polyphenols and probiotics.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report, it was proposed that the high level of publication by the most active team members should be maintained and that of the more vulnerable ones should be increased. The team Fine has published in very good to excellent journal in the field and has acquired several prestigious funding since the last period of review.

Moreover, restructuring in two themes was seen as a strengthening for the scientific and social cohesion within the team, thereby enabling the maintenance of the scientific output of those being very active while enabling those being less active to grow. It was suggested to take measures like meetings and seminars to enhance the scientific communication within the team.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	4
Chargés de recherche et assimilés	4
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	**13**
Enseignants-chercheurs et chercheurs non permanents et assimilés	1
Personnels d'appui non permanents	2
Post-doctorants	1
Doctorants	5
Sous-total personnels non permanents en activité	**9**
Total personnels	**22**

EVALUATION

Overall assessment of the team

All in all, the team can be considered excellent to outstanding. During the evaluation period, the team has not only been successful in acquiring third party funding including a prestigious ERC advanced grant but has also published several manuscripts in a peer-reviewed journal that are considered excellent. Despite some marked fluctuation in the teams' composition, the research team seems to have been able to integrate the skills added through the newly joining researcher and even secure some funding related to this expansion on the research portfolio.

Strengths and possibilities linked to the context

The team has been very successful in acquiring third party funding at national and EU levels, with one ERC advanced grant. This has provided the team with sufficient financial support to perform excellent research.
The team is nationally and internationally very well recognised in its field as documented by>60 invitations to provide scientific talks but also to act as reviewers on (national) grant committees as well as for prestigious journal in the field at various occasions. Members of the team have contributed to several functions not only within Micalis but also Inrae Jouy-en-Josas centre and University Paris-Saclay thereby connection and interaction with other groups. Also, there are several ongoing partnerships with industrial partners.

The team has developed models and tools to investigate host-microbiota interrelationships in both mice and humans but also by employing ex vivo techniques, thereby opening the route to assess the interaction of host microbiota in even greater width and depth at various levels.

Weaknesses and risks linked to the context

While the team has been very successful in acquiring third party funding from several sources and has had an excellent and even outstanding scientific output with respect to scientific publications for an extended period of time, the number of PhD students continuing beyond 2023 seems rather low. Moreover, there has been and will be more fluctuation in the permanent staff due to retirement. This might also bear a risk with respect to sustaining the research topic over an extended period at the present level of excellence. This could be of special importance with the consideration of the retirement of one senior scientist.
While delineating a very well-defined research plan for next years, it seems that this is rather wide e.g. ranging from understanding fibrolytic function to anorexia nervosa. This might bear some risk, especially when considering the upcoming changes in staff; however, it might also open new opportunities for collaboration.

Analysis of the team's trajectory

The team has developed models and tools allowing for an in-depth study of the interaction of the host-microbiota interrelationship. The team has evolved around two research axes which are also backed by funding and workforce. Specifically, the team defined an axis focusing on intestinal ecology with a specific focus on the understanding and deciphering of mechanisms governing the intestinal ecosystem and its function to preserve and restore host-microbiota symbiosis as one axis. Scientific approaches range from studies in model organisms to cohort studies. Moreover, the understanding and optimisation of the fibrinolytic functions of the human gut and consequences for food and health are and will be assessed employing functional ingredients found in human nutrition. In axis 2 the team will focus on the molecular mechanism of the host-microbiota interrelationship with a specific focus on the innate immune receptor ALPK1 as well as on the regulation of gut hormones. Moreover, in this axis the team will also assess the role of microbiota in the development of anorexia nervosa.

RECOMMENDATIONS TO THE TEAM

The team is encouraged to continue its very successful, excellent to outstanding path taken with respect to publications and acquiring third party funding. However, in light of a rather constant change in the composition of the team it might be beneficial to expand the efforts to include more young scientists in the team e.g. PhD students that may continue beyond their PhD thesis.

Team 18: Integrated Biology of Microbial Lipid Metabolism (BIMLip)

Name of the supervisor: J-M Nicaud

THEMES OF THE TEAM

The main focus of the team has been on systemic biology and on adding to the understanding of the lipid metabolism of Yarrowia. To accomplish these tasks, the team has developed four axes: (1) Metabolic engineering of Yarrowia lipolytica to the production of sustainable bioproducts, (2) understanding and engineering of its lipid metabolism, (3) dissemination of tools developed by the team and (4) understanding of secretarial pathways and their regulation for recombinant protein production. Herein the team has applied its knowledge to develop biofuels, biolipids, bioplastics, and worked within `white chemistry´. Moreover, the regulation of protein secretion has been assessed in the context of enzyme production.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report it was recommended to the team to maintain its output and, if possible, aim for publications in journals that are more widely recognised in the field. Moreover, it was pointed out that BIMlip should increase its visibility to the non-academic/industrial world by making the scientific out more accessible to the layman, thereby also increasing the probability to obtain new funding and improve public awareness of its importance to science. It was also pointed out that the rather small size of the team (5 permanent staff members in 2020) may be problematic and that herein especially the lack of a technician could be problematic.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**2**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	**0**
Sous-total personnels non permanents en activité	**0**
Total personnels	**2**

EVALUATION

Overall assessment of the team

The overall assessment of the team ranges from very good to excellent. The team´s scientific output has been very good with a considerable number of patents and publications in good to very good peer-reviewed journals (>50); however, the number of publications in highly recognised journals is limited. Also, during the evaluation period efforts with respect to training, e.g. PhD thesis, were limited; however, taking the rather small size of the group and the perspective of being discontinued into consideration, this is understandable.

Strengths and possibilities linked to the context

The team´s work has focused on alternative routes to produce lipids, fuels and plastics as well as on avenues that could be taken with respect to the degradation of the latter. These are very timely and with respect to the environment needed to topics. The team seems to have also taken comments related to an increase in the interaction with industrial partners provided in the due course of the last evaluation in consideration. Moreover, while not having obtained large financial support, there was a steady influx of third-party funding not only from national funding agencies but also industrial partners. Moreover, having been involved in the development of molecular biology tools including update tools such as `Golden Gate Assembly´ shared through Addgene, the team has continuously reached out to other researchers even without specific (bidirectional) collaborations.
In general, the team's impact on the economy and collaboration with industrial partners has increased thereby enabling a transfer from academic findings in the non-academic world. This seems to have been a key focus of the team during the last evaluation period which has also resulted in some funding.

Weaknesses and risks linked to the context

Despite the rather small sized group, the team has published continuously several scientifically valuable publications each year; however, the number of publications in medium to high impact factor journal was low. Also, the outreach to the public beyond industry has to be considered rather low.

Analysis of the team's trajectory

The team has taken up the considerations and suggestions given in the previous report. It has built a logical continuation of the research activities focusing on the ability of yeast to grow on a variety of carbon sources and its metabolic pathways that can be of great use for alterative (bio) technological applications. Accordingly, four axes were established in the BIMlip team comprising of a focus on metabolic engineering yeast Yarrowia lipolytica for the production of sustainable bioproducts (e.g., biofuels, biolipids, bioplastic), a focus on the yeasts lipid metabolism, and on the understanding of secretarial pathways as well as on taking new routes to disseminate knowledge obtained by the team to others e.g. industry and scientists.

RECOMMENDATIONS TO THE TEAM

The BIMlip team has been discontinued. Still, during the last evaluation period several efforts to strengthen the interaction with industrial partners as well as to increase the availability of findings to the general scientific community have been undertaken. All this seems to have been very successful.

Team 19: Mutagenesis in Single Cells and Evolution (MuSE)

Name of the supervisor: M Elez

THEMES OF THE TEAM

The team, which started in 2020, is focused on characterising mutagenesis and its impact on evolution towards the prediction and control of mutagenic processes in the context of antibiotic resistance.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Not applicable.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	2
Sous-total personnels permanents en activité	**4**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	2
Doctorants	1
Sous-total personnels non permanents en activité	**4**
Total personnels	**8**

EVALUATION

Overall assessment of the team

The overall performance is rated as excellent. The team has made substantial contributions even during the relatively short time since its inception. The scientific output is considered excellent to outstanding, reflected in publications and participation in important funding schemes. The visibility within the scientific community is excellent, with active participation in mostly national conferences.

Strengths and possibilities linked to the context

The rationale behind the three projects planned for the next term is excellent. The combination of microscopy, microfluidics, and molecular biology approaches is convincing and well explained in the context of the objectives. The topic of genetic and evolutionary basis for microbial antibiotic resistance is timely and important.

Weaknesses and risks linked to the context

The team is still relatively new, and the international projection of their research should be strengthened to ensure visibility. A permanent engineer would be an important addition to the team. The competition at the international level is substantial, since the topic of resistance to antimicrobials is a subject pursued globally by

many leading research centres and universities. Defining a strategy that can be considered unique would be important for the next term while moving forward with the planned objectives.

Analysis of the team's trajectory

The group's trajectory is short, but already promising.

RECOMMENDATIONS TO THE TEAM

The team is in a stage of consolidation. Reinforcing the quantity and quality of scientific publications and team expansion should be in focus for the next term. The balance between PIs and trainees could be boosted by incorporating students and postdocs.

Team 20: Systems Biology for Bacterial Engineering and Redesign (SyBER)

Name of the supervisor: M Jules

THEMES OF THE TEAM

The team focuses on a very timely and relevant scientific challenge, namely, how to harness genetic and genome engineering approaches to understand nature. In this context, they develop three axes of applications: (1) decoding gene expression for precise control of synthetic circuitry, (2) implementing synthetic bacteria and consortia designed for the identification and characterisation of fundamental cellular functions, and (3) engineering synthetic devices to establish orthogonality and potentially uncover novel functions. The team is currently composed of fifteen members, including one postdoc and three PhD students.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In response to the previous evaluation's recommendations, the team has made notable progress in the aspects highlighted in the report.

"An effort should be made for the participation to national or international conferences in order to maintain the team's visibility."
The team members have participated in several international conferences, including active participation in organising some of these.

"The shrinkage of the size of the team may impact its technical/scientific competences, and a strategy to possibly reduce the number of scientific axes may have to be drawn in case no additional permanent staff is recruited. Some projects may diverge too much from the strong synthetic biology axis."
The team has undergone a very positive restructuring that allowed a clear focus on the directions proposed by the team leader.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	1
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	5
Personnels d'appui à la recherche	4
Sous-total personnels permanents en activité	**11**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	0
Doctorants	3
Sous-total personnels non permanents en activité	**4**
Total personnels	**15**

EVALUATION

Overall assessment of the team

The overall performance is rated as excellent to outstanding. The team has made notable progress in their field and has ample visibility in the national and international context. The scientific output is considered excellent to outstanding, as reflected in the publications in specialised journals of the field. The visibility within the scientific community is excellent to outstanding with a clear international dimension, and active participation in national and international conferences. The engagement with the non-academic sector is excellent and includes innovative communication channels such as short films and podcasts.

Strengths and possibilities linked to the context

The team keeps its leading role and international recognition in functional and synthetic genomics of Bacillus subtilis. The funding of the team continues to be excellent, based on both national and international programs (ANR, Inrae, EU H2020), which will ensure the sustainability of the team's directions, now mostly focused on synthetic biology. The team also has a strong focus on training, and they co-head two master programs, which is an important aspect of their activities.

Weaknesses and risks linked to the context

It is recommended that the team continues to invest efforts in increasing the scientific output, especially in terms of high-level publications in broad journals to increase visibility. This aspect should not be considered a weakness but rather a recommendation, since the members of the team have demonstrated their engagement in boosting scientific output. Considering the applied nature of some of the project axes, some efforts could also be invested in innovation and IP protection.

Analysis of the team's trajectory

The group's trajectory is clear and well structured and formulated, especially in the light of the restructuring of some axes of applications. The research plan is ambitious with different expertise allocated to the running projects. There is a clear strategy for resources from funding and collaborations (national and international) to execute the scientific program.

RECOMMENDATIONS TO THE TEAM

The team has undergone a substantial restructuring since the last evaluation, with the leadership taken into synthetic biology using B. subtilis as a model. Effective management and strategic planning will be important to ensure that the team's size and structure do not hinder their productivity and innovation moving forward, especially considering the extra time invested in administrative responsibilities, which could be cumbersome. Notwithstanding, the overall assessment of the team is to be considered excellent to outstanding, and we recommend that the team maintains the same level of excellence in their future work.

Team 21: Retro Synthetic Biology (BRS)

Name of the supervisor: J-L Faulon

THEMES OF THE TEAM

The team adopts retrobiosynthetic approaches to solve problems in the industry and health sectors by implementing cutting-edge synthetic biology. The overall objective is designing and engineering metabolic pathways and genetic circuits in the whole cell (E. coli) and cell-free systems. The approaches implemented to this end include computer-aided design and automation, sensing enabling metabolic pathways, and analogue and digital signal processing.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

No specific considerations were made in the previous report.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	1
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	3
Sous-total personnels permanents en activité	**6**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	4
Post-doctorants	3
Doctorants	3
Sous-total personnels non permanents en activité	**10**
Total personnels	**16**

EVALUATION

Overall assessment of the team

The overall performance is rated as outstanding. The team has made exceptional progress in the field of synthetic biology and has ample visibility in the national and international context. The scientific output is considered outstanding, as reflected in the publications in specialised journals of the field and also in general journals with a broad readership. The visibility within the scientific community is outstanding with a clear international dimension, and active participation in national and international conferences. The engagement with the non-academic sector is excellent and includes innovative communication channels such as a YouTube channel.

Strengths and possibilities linked to the context

The rationale behind the three projects planned for the next term is excellent. The plans for future collaborations within the unit are also excellent, involving the Cell-Free Biofoundry, which is internationally recognised. These objectives will continue to attract attention in synthetic biology. The project to engineer biology to compute (in

two axes, bottom-up and top-down) is rather impressive, and the plans presented by the team leader for future activities are logical and timely. The collaborators are well chosen and Micalis institute members are properly included, and a new budding team will emerge from the current team.

Weaknesses and risks linked to the context

No major weaknesses to report.

Analysis of the team's trajectory

The group's trajectory is exceptional, with an overall research plan that is both ambitious and excellent, with different and relevant expertise allocated to the running projects (both in silico and wet-lab). There is a clear strategy for resources from funding and collaborations (national and international) to execute the scientific program. The active participation in outreach and teaching is exemplary.

RECOMMENDATIONS TO THE TEAM

The team is well established with a solid visibility at both the national and international levels. The combination of in silico and wet-lab approaches is outstanding, and the leadership is excellent. The scientific output is outstanding, and we can only commend the team leader for the group activities so far. Moving forward, it is recommended that timely interactions are kept with the industrial and medical sectors in order to ensure that the team's output (for instance, biosensors) is evaluated with respect to their applicability and exploitation in the real world. In this sense, IP protection could be an important aspect to consider. Finally, maintaining open-source websites is often costly, and websites are in constant danger of getting forgotten when a team is moving forward. The committee encourages that a maintenance plan be implemented to ensure that the broad scientific community can access these valuable resources. In all, the team, the proposed projects, and the scientific content of this group are world class.

Team 22: Prokaryotic Cell Development (ProCeD)

Name of the supervisor: R Carballido-López

THEMES OF THE TEAM

The team is interested in how molecular interactions are regulated to form functional machineries that help facilitate the establishment of cellular functions in bacteria. They are in particular interested in the bacterial cytoskeleton and on the cell envelope in the context of environmental and host-pathogen interactions. The main bacterial models that the team focuses on are Bacillus subtilis and Pseudomonas aeruginosa.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The committee recommends that the team leader maybe reduce the number of activities outside the team, in order to have more time for supervision and development.
The team leader has remained active outside the team, but this has not negatively impacted on the team's performance during the period.

The website could be improved to enhance visibility to the non-academic world. This has been addressed with a good visibility of the group on the Micalis website https://www.micalis.fr/equipe/proced/.

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	1
Sous-total personnels permanents en activité	**3**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	1
Post-doctorants	3
Doctorants	3
Sous-total personnels non permanents en activité	**7**
Total personnels	**10**

EVALUATION

Overall assessment of the team

The scientific production of the team is excellent with a total of sixteen publications, which is commensurate with the size of the team. Their attractiveness is outstanding with both a strong national and international recognition in the bacterial cell biology area, and in particular in the bacterial actin field. The team has had an outstanding record of successfully acquiring research funding to support their research. The team's interaction in the socio-economic world is limited, which may reflect the basic nature of their work. The general assessment of this team is excellent to outstanding.

Strengths and possibilities linked to the context

The team was typically composed of between ten to fifteen members during the period. It is composed of three permanent staff (director of research, senior scientists and research engineer) and hosted 27 non-permanent staff during the period. These include nine Post Docs and six PhD students. There are currently three Post Docs and three PhD students in the team. Team members have undertaken a number of scientific responsibilities including numerous thesis juries (17), HDR juries (6) and thesis committees (6). They have acted as reviewers for international funding bodies including ERC, the Wellcome Trust and EMBO and acted as peer reviewers on fifteen publications. The PI is also editor for the journal Cell Surface and a SAB member of the LCB in Marseille. The PI received the Inrae Scientific Excellence Award (2019-2023). The PI has delivered three keynote lectures at international conferences together with seventeen invited talks at conferences/seminars including the Gordon Conference and the Janelia Conference both in the USA in 2022, among others. The team has an international visibility in the bacterial cell biology community. In total, six PhD students, nine M2, two M1 and three undergraduate students were trained, together with nine postdoctoral researchers. The team was also involved in M2 and practical courses at Univ. Paris-Saclay, together with a PhD program course in Lisbon (2021).

The team have an outstanding record of successfully obtaining funding during the period, involving a total of around 3.43M€ involving ten grants, of which three were as coordinator and one was a prestigious ERC consolidator grant totalling 1.9M€. The team has made important contributions to their field of research, including in particular the development of a TIR-FCS methodology to allow the direct quantification of membrane fluidity in bacterial cells. In addition, they have performed an integrative study on the effect of antibiotics targeting the B. subtilis cell wall. The scientific production of the team is excellent with a total of fourteen publications, and two reviews/book chapters, which is commensurate with the size of the team. The majority of these papers appear in very relevant journals in the area, with some being published in high-profile journal (Krokowski et al., 2018 Cell Host Microbe; Mirouze et al., 2018 Nat. Commun). Moreover, seven of these publications, bear the signature of a PhD student in the group. Regarding non-academic interactions by the team leader is involved in the jury of the regional calls on scientific, technical and industrial culture (CSTI) "La science pour tous".

Weaknesses and risks linked to the context

There is little evidence of interactions with the socio-economic world which is likely to be reflective of the basic nature of the team's work.

Analysis of the team's trajectory

The team will continue to focus on the study of bacterial cell morphogenesis and in particular on MreB proteins. This will involve in vitro characterisation of these proteins, imaging on synthetic membrane systems, quantification of the fluidity and molecular dynamics in the bacterial membrane using TIR-FCS and the study of the mode of action of cell wall antibiotics. They will also focus on the cell biology of phage infection and also on use fluorescent microscopy imaging to study the cell biology and antibiotic resistance/ resensitisation in P. aeruginosa.

RECOMMENDATIONS TO THE TEAM

The team is encouraged to continue its outstanding track record of grant acquisition.

Team 23: Synthetic Consortia and Cell Factories (Cosynus)

Name of the supervisor: T Rossignol & Y-K Park

THEMES OF THE TEAM

The Cosynus team has been created recently (2023) by two people from the Micalis Bimlip team (DR and CR). Their goal is to create innovative strategies, i.e. development of synthetic consortia (yeast and bacteria) to produce value-added molecules using renewable carbon sources.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

NA

WORKFORCE OF THE TEAM: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	0
Maîtres de conférences et assimilés	0
Directeurs de recherche et assimilés	1
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	0
Sous-total personnels permanents en activité	**2**
Enseignants-chercheurs et chercheurs non permanents et assimilés	0
Personnels d'appui non permanents	0
Post-doctorants	0
Doctorants	1
Sous-total personnels non permanents en activité	**1**
Total personnels	**3**

EVALUATION

Overall assessment of the team

N/A

RECOMMENDATIONS TO THE TEAM

The Cosynus young team is quite small with only two permanent staff, one PhD student and a permanent research engineer (since January 2024). However, they are very active in submitting projects to get the financial supports enabling the recruitment of PhD and postdoc fellows. The development of synthetic biology tools is of great interest for private companies and the Cosynus team has already licensed one toolkit (2023) and plan to continue this approach. The team is strongly encouraged to develop its projects.

CONDUCT OF THE INTERVIEWS
Dates

Start: November 13, 2024 at 8 : 30 a.m.

End: November 14, 2024 at 4 : 30 p.m.

Interview conducted: on-site

INTERVIEW SCHEDULE

DAY 1, Wednesday, Nov, 13

8:30 – 8:45 **Preliminary meeting of the expert committee** (closed hearing) Amphi building 440
8:45 - 9:00 **Presentation of the HCERES evaluation to the unit** (CS)
9:00 - 10:30 **Presentation of the Unit and Common facilities: activity and trajectory** (70' + 20'discussion)

10:30-10:55 **Coffee break -** Building 442, Room 221
11:00-12:45 **Parallel team presentations**

	Committee 1- Amphi 440	
11:00-11:35	***ComBac***	Delorme & Juillard
11:35-12:10	***CPE***	Serror
12:10-12:45	***EpiMic***	Pagliuso

Committee 2- Auditorium 442	
BaPS	Janoir
B3D	Briandet
DynPhages	Petit

12:45-13:45 **Lunch -** Building 442, Room 221

14:00-15:00 **Meeting w/staff - Parallel meetings** (closed hearings)
- Meeting with technical and administrative personnel (in French) - Auditorium 442
- Meeting with PhD students and post-doctoral fellows - Grande Salle Erist 400
- Meeting with researchers and professors - Amphi 440

15:00-15:30 **Committee debrief + Coffee break** – Building 442, Room 221

16:00-17:20 **Parallel team presentations**

	Committee 1- Amphi 440	
15:30-16:05	***GME***	Nielsen-Leroux & Slamti
16:05-16:40	***MicrobAdapt***	Gaudu
16:40-17:15	***PIMs***	Rama Rao

Committee 2 – Auditorium 442	
FME	Champomier-Vergès & Chaillou
ChemSyBio	Berteau & Benjdia
MIHA	Rhimi & Maguin

17:30-19:00 **Committee debriefing**

DAY 2, Thursday, Nov, 14

9:00–11:15 **Parallel team presentations**

	Committee 1- Amphi 440		Committee 2 – Auditorium 442	
9:00-9:35	***Paroi***	Chapot-Chartier	***FInE***	Lapaque
9:35-10:10	***Amipem***	Gérard	***MuSE***	Elez
10:10-10:45	***ProbiHôte***	Langella	***SyBER***	Jules
10:45-11:20	***PhylHom***	Lepage	***Bio-RetroSynth***	Faulon

11:20–11:50 **Committee debriefing + coffee break - Building 442, Room 221**

11:50–12:50 **Parallel team presentations / Visit**

	Committee 1		Committee 2 – Auditorium 442		
11:50-12:25	***visit of premisses/ PF***		***ProCeD***	Carbalido Lopez	
12:25-12:45			***Cosynus***	Rossignol & Park	20'

12:45–13:45 **Lunch - Building 442, Room 221**

13:45–14:45 **Meeting with supervisory bodies (INRAe, AgroParisTech, UPS) Auditorium 442**

14:45–15:15 **Meeting with Unit's directory board**

15:30–16:30 **Committee debriefing – departure**

Note for time slots
Renewed team: 15 min + 10 min (Qs) + 5 min (PI only) + 5 min debrief
New team - Future only: 10 min + 5 min + 5 min (PI only)
Closing team: 10 min + 5 min + 5 min (PI only)

Committee 1	Committee 2
COCAIGN	NIKEL
LEULIER	**JAULT**
ROBERT	FORESTIER
BELZER	DOBSON
SCHÜLLER	BERGHEIM

CS Hcéres C. Elchebest I. Attrée

GENERAL OBSERVATIONS OF THE SUPERVISORS

A Palaiseau, le 2 avril 2025

Objet : Observations de portée générale sur le rapport DER-PUR260024772 - MICALIS - Microbiologie de l'alimentation au service de la santé.

Au département d'évaluation de la recherche du HCERES

Comme demandé dans votre message du 21 janvier 2025, vous trouverez ci-dessous les observations de portée générale sur ce rapport, rédigées en concertation entre les tutelles, en anglais, en cohérence avec la langue du rapport.

INRAE (AlimH and MICA divisions), AgroParisTech and Paris-Saclay university would first thank the members of the committee for their impressive and thorough work of analysis and recommendations.
They also would like to commend, as the committee did in its report, Philippe Noirot for the high quality of the management of Micalis leading to the global assessment "excellent", Micalis being unique in France and very competitive at international level.

The supervising bodies took note of different points raised by the committee and will support the units to address these concerns: the installation of an international scientific advisory board (SAB); the global management of the teams (more homogeneity and collaboration between teams, emergence of the future team leaders, …). They also took note of the concern relative to the decline in permanent technical staff and will think about solutions to address this issue which is not limited to MICALIS.

In addition, we would like to raise the attention of the committee to the following points:
1- The committee timely reports the success of MICALIS in gaining the financial support from regional (e.g. Région Ile-de-France) and national calls (e.g. France 2030), and its positive impact on the dynamism and performance of the unit. But it was meanwhile considered by the committee as a weakness/risk based on the lack of long-term vision on the political context (p.9). We dare mention that the unit took advantage of the calls to obtain funds on its scientific priorities that were already recognized by institutional bodies and funding agencies (at national and international levels), prior to the launch of France 2030 or DIM programs.
2- We are grateful to the HCERES scientific committee for the re-assessment of TEAM 1 (B3D) and TEAM 16 (PhylHom). However, we are surprised that the removal of four factual errors that were weaknesses or recommendations to improve did not translate into an improvement of TEAM 16 overall assessment.

For AgroParisTech
Alexandre PERY
Directeur de la Recherche,
de l'Innovation et du Transfert Technologique

For INRAE, AlimH Division
Lionel BRETILLON
Chef du département

For Université Paris-Saclay
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