

EVALUATION REPORT ON THE UNIT

NEURO-DOL - Pathophysiology and
Pharmacology of Pain and Migraine

UNDER THE SUPERVISION OF INSTITUTIONS AND RESEARCH BODIES:

Université Clermont Auvergne - UCA

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

EVALUATION CAMPAIGN 2025-2026
GROUP A



On behalf of the committee of experts:

Emmanuel Hermans, Chairperson of the committee

For Hcéres:

Coralie Chevallier, President

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

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

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

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

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Ms Laurène Alard, Inserm
Ms Vanessa Prevot, Université Clermont Auvergne
Mr Denis Vivien, Inserm

UNIT CHARACTERISATION

- Name: Pathophysiology and Pharmacology of Pain and Migraine
- Acronym: NEURO-DOL
- Label and number: U 1107
- Number of teams: 2 + 1 New Team
- Composition of the executive team: Mr Radhouane Dallel (director)

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement
SVE5 Neurosciences et troubles du système nerveux

THEMES OF THE UNIT

The Unit "Pathology and Pharmacology of Pain and Migraine" (Neuro-Dol) (UMR1107 Inserm/University Clermont Auvergne -UCA-) includes two teams whose objective is to develop both basic and clinical research on an important topic: the pathophysiology of pain. While Team 1 is dedicated to fundamental and clinical pharmacology of Pain, Team 2 focuses on trigeminal pain and migraine.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

Neuro-Dol is a Neuroscience research unit, located within the schools of Health and university hospitals of Clermont-Ferrand. It is a joint research unit whose institutional partners are Inserm and the University Clermont Auvergne (UCA). Founded in 2012, this unit originated from the merger of two previously independent research units and initially comprised three teams. During the last evaluation for the 2021-2026 contract, Team 3 (different from the novel Team 3 proposed for 2027) was not renewed because of its size that did not meet Inserm criteria (at least a full-time researcher and five full-time equivalent staff) and its members were then integrated into the two other teams. These two remaining teams are located on two different sites: Team 1 occupies the 6th floor of ~1,300 m²-shared building with the Faculties of Medicine and Pharmacy, at the Gabriel-Montpied hospital; Team 2 is housed within a 967 m²-renewed space of the Faculty of Dentistry at the CHU of Estaing site.

UNIT RESEARCH ENVIRONMENT

The privileged location of the Neuro-Dol unit on the university hospital campus allows to establish strong ties with the university hospital center (CHU) of Clermont-Ferrand which hosts several members of Neuro-Dol belonging to different hospital departments such as dentistry, neurology, palliative care, pharmacology, psychiatry... Several unit members have developed some specialized structures for managing chronic pain (Chronic Orofacial Pain; Migraine consultation; Painkiller Addiction...) and take part in various hospital commissions (Medical Board of Establishment, Clinical Research and Innovation department, Biomedical and Public Health Research Committee of the CHU, The Pain Committee of the University Hospital...).

Within the University, Neuro-Dol is part of the Institute of Life Sciences, Health, Agronomy and Environment (SVSAE), where several members of the unit play a key role in the executive board and are dean or vice-dean of the Faculty of Medicine and Paramedical Professions or the Faculty of Pharmacy. It is strongly committed to the program of the UCA's strategy of excellence (I-Site Cap20-25 project), particularly within one of the four strategic scientific International Research Centers (IRC) for which the unit director is a member of the international research center Governance Committee.

The unit also contributes to the economic outcome of research with the Auvergne-Rhône-Alpes (AURA) region, in particular two unit' members are coordinators of the CHRONIDOL project granted by FEDER which have secured several fundings for equipment (two multi-photon microscopes and in vitro multi/microelectrode array).

The Neuro-Dol unit has strongly contributed to several cross-disciplinary shared platforms supervised or run by its own staff members: imaging facilities at the university's Cell Imaging Center for Health Research; analytical facilities from the Centre for Resources in Analytical Pharmacology and Toxicology (CREPTA); metabolism exploration platform, a collaborative structure between INRAE and UCA (PFEM). The unit has also access to hospital facilities, such as the Clinical Investigation Center (Inserm's CIC 405) and the CHU's clinical pharmacology platform in Clermont-Ferrand.

The unit is actively involved in international (Francophone Pain Research Symposium), European (EFIC research committee, European Pain Federation...), and national (French Pain Research Network, ANSM, HAS recommendations...) research networks. It has also established collaborations with pharmaceutical companies

(Innopain, ANS biotech, VitroBio Pharma, ...) and has developed research projects in various cultural, economic or social sectors (NOVESIA, part of the ANALGESIA Foundation, Greentech, Pharmaleads, Novartis, Air Liquide...). All this environment (hospital, university, Analgesia foundation financial support) has allowed to create the first national chronic pain patient cohort (>2,300 patients cohort led by a member of the unit) and the French Pain Research Network (FPRN) chaired by the unit director.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	17
Maitres de conférences et assimilés	21
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	2
Personnels d'appui à la recherche	18
Praticien hospitalier	4
Sous-total personnels permanents en activité	62
Enseignants-chercheurs et chercheurs non permanents et assimilés	8
Personnels non permanents d'appui à la recherche	0
Post-doctorants	1
Doctorants	23
Sous-total personnels non permanents en activité	32
Total personnels	94

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

Nom de l'employeur	EC	C	PAR
UCA	37	0	13
Inserm	0	2	4
Autres	1	0	5
Total personnels	38	2	22

GLOBAL ASSESSMENT

The Neuro-Dol research unit is the only one in France, and among the few in Europe, entirely dedicated to clinical and fundamental research on pain, whether cephalic or extra-cephalic. The overall objective of the unit is to develop both basic and clinical research on the pathophysiology of pain. It comprises approximately one hundred people, organized into two teams with clearly defined scientific objectives. Team's 1 objectives are organized into 4 axes, mainly focused on chronic pain, while those of Team 2 focus primarily on trigeminal pain and migraine.

The outstanding quality of its research is demonstrated by several lines of evidence and relies on several strengths. First, the unit stands out for its multidisciplinary and translational approach, fostering strong connections between research, hospitals, and the biotech/pharmaceutical industries. For example, the privileged location of the Neuro-Dol unit on the university hospital campus has enabled its members to build strong collaborations with the hospitals of Clermont-Ferrand. These hospitals host several Neuro-Dol members across different departments, where specialized structures for managing chronic pain have been established. Several members take part in hospital commission, in particular the Pain Committee of the University Hospital. Within the University, Neuro-Dol is part of the Institute of Life Sciences, Health, Agronomy and Environment, where several members

of the unit play a key role in the executive board and are dean or vice-dean of the Faculty of Medicine and Paramedical Professions or the Faculty of Pharmacy. The unit also plays a key role as coordinator of the French Pain Research Network, recognized and supported by Inserm and CNRS.

Secondly, the unit and its teams have the human and technological resources and expertise to carry out projects and meet objectives, even with only 2 full-time permanent researchers, which is exceptional. Indeed, the Unit is composed of 40 permanent researchers from different background (MD including psychiatrists, pharmacists, fundamental scientists, engineers, physiotherapists) with complementary expertise which are assisted by 18 permanent qualified supporting personals, an excellent ratio for an academic research unit in France (2:1 but closer to 1:1 considering full-time equivalents). The Unit has access to a very large diversity of experimental approaches (equipment, and state-of-the-art technological platforms).

Furthermore, the unit has a significant scientific output (n=462 including 247 on pain, 60% as main authors), published in leading, high-impact journals that are among the most recognized in the field (Pain, Neuron, Brain, but also, in a lesser extent, on less specialized journals such as PNAS or Nature communication).

The Unit has also demonstrated an outstanding capacity to consolidate research fundings through successful applications to national, European and international grants (~15M€, 73% as PI). This included 7 ANR (4 as PI), newly obtained during the 2019-2024 period.

DETAILS OF THE EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

According to recommendations from the previous report, the visibility of the research unit in the field of pain has been enhanced by increasing the participation of several researchers and clinicians to international editorial board of journals (9 different international journals), and by the increase of the participation of the laboratory members to international congresses (84 invitations to give a talk). Although the research unit published in leading generalist journals (Lancet Neurology, Nature Neuroscience, Neuron, ...), most of these publications have been confined primarily to collaborative work rather than to research initiatives conducted under the direct auspices of the unit. The visibility of publications in the clinical domain has been improved with several publications in the best neurology journals (Lancet Neurology, Lancet Global Health, Brain, Pain, Clinical Gastroenterology & Hepatology, ...).

Concerning the parity in recruitment and responsibilities, gender balance is almost achieved in the composition of the research unit for the next period, with 39 women and 43 men. However, women remain underrepresented in research leadership positions, with only one woman and six men as PI in Team 1, and two women and six men as PI in Team 2. In the future Team 3, 1 man and 1 woman will co-lead the team.

Regarding the recruitment of full-time researchers, while the unit has made progress in attracting new members with diverse expertise, most of them originate from the regional University and the local Hospital. The current number of full-time researchers (Inserm staff and postdoctoral fellows) remains below expectations for a unit of this magnitude, with only one Inserm researcher in Team 1, one in Team 2, and three postdoctoral fellows across all teams.

The integration of members from the former Team 3 into Teams 1 and 2 appears to have proceeded successfully. Interactions and collaborations between the two teams are effective, as evidenced by the implementation of methodologies involving technical personnel from both groups (including tissue clearing and specialized behavioral studies) as well as by joint scientific initiatives that have resulted in co-authored publications (eight articles to date).

Concerning the high number of projects and their funding, although the unit and its teams have undertaken a reorganization to address this recommendation, the overall number of projects and subprojects remains substantial. Managing such a wide array of initiatives under optimal conditions constitutes a significant human and financial challenge, particularly given the current constraints affecting research funding in France. The unit's principal strength lies in its capacity to integrate both human and animal research approaches. While notable progress has been achieved in this regard -illustrated by the securing of several PHRC (programme hospitalier de recherche clinique) grants aimed at validating hypotheses arising from the laboratory's preclinical work- the full and systematic integration of these complementary dimensions within the unit's flagship studies appears to remain a work in progress. It is encouraging, however, that issues related to spontaneous pain and sex differences have been explicitly incorporated into the unit's preclinical research activities.

B - EVALUATION AREAS

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

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

The overall objective of the unit, multidisciplinary by nature, is to develop both basic and clinical research on the pathophysiology of pain. Team 1's objectives are structured around four main axes, primarily addressing chronic pain, whereas Team 2 focuses mainly on trigeminal pain and migraine. **The scientific objectives of the unit are overall excellently aligned with patient suffering and care needs** (29 million people yearly affected in France). The unit's integration within local (CIC, CHU) and national infrastructures, combined with its extensive multidisciplinary expertise in terms of human and technological resources, makes it a unique entity in the French academic landscape for conducting projects and achieving its objectives. The unit has also been highly successful in securing funding, obtaining over €15 million during the evaluation period—mostly as principal investigator (PI)—including grants from national competitive agencies such as ANR ("Agence Nationale de la Recherche"), although its success rate at the international level remains relatively low (around 4%).

Context-related strengths and opportunities for the four references above

Neuro-Dol is among the largest academic research unit dedicated to pain research in France. The scientific objectives of Neuro-Dol are clearly defined and properly organized in two different teams. Team's 1 objectives are organized into 4 axes (chronic pain, pain associated with cancer, signaling pathways deregulated in pain, role of gut microbiota in pain), while those of Team 2 focus on trigeminal pain and migraine, according to 3 axes (mechanical pain, chronic migraine and validation of new therapeutic targets). The teams are hosted within the faculties of Medicine and Dentistry, respectively, and benefit from spacious, recently renovated facilities. However, the physical distance between the two entities can sometimes limit interactions. Team 1 and Team 2 have the appropriate equipment, staff and technical skills to reach their research objectives. Team 1 is composed of 37 people with a permanent position, including 11 technical staff ensuring proper access to preclinical models and platforms/facilities. Team 1 uses state-of-the-art platforms, including analytical facilities (Toxicology, headed by a team1 member), Metabolism Exploration Platform (metabolomics and proteomics projects), human facilities (the head of the CIC is also a member of team1), imaging facilities (Cell Imaging Center for Health Research for electronic and confocal microscopies, laser dissection and flow cytometry and confocal imaging platforms). Team 2 is made up of 43 members including one full-time researcher and 7 supporting personals with access to Cell imaging center from the University.

The multidisciplinary nature of the unit research (in vitro and ex vivo studies, patient evaluation in different clinical departments...) is also a clear advantage of Neuro-Dol mainly because of the gathering of pharmacists, biologists, mathematicians; physicians and dentists with expertise in anesthesiology, biophysics, biology, dentistry, gastro-enterology, microbiology, neurology, pharmacology or psychiatry, among other disciplines.

The unit's scientific excellence is reinforced by its outstanding ability to secure external funding, which accounts for 88% of its total budget of €15.16 million. A significant portion comes from local sources (29%, including regional and hospital support) and national programs (30%) such as ANR (8 ANR with 4 as PI, PHRC) and other national grants complemented by contributions from the PIA, charities, foundations, and industrial partners. This represents a significant increase of more than one-third compared to the previous evaluation period, highlighting the unit's strong commitment to and success in securing research grants.

Projects are carried out with great commitment by all team members, who take deep pride in the unit's achievements. This is supported by a generally positive working atmosphere. Decisions are shared and reached through consensus among the various staff categories. However, it is regrettable that meeting outcomes, particularly key decisions, are not systematically documented in minutes or archived.

Context-related weaknesses and risks for the four references above

The unit's permanent Principal Investigators (PIs) are predominantly researchers who also hold clinical or teaching responsibilities, with only two full-time research-focused investigators. This composition reflects a strong clinical orientation but limits the presence of purely research-driven profiles. Despite this, the development of robust translational research remains a significant challenge for the unit at this stage, indicating an area for strategic improvement. In terms of funding, the unit demonstrates substantial success at the national level,

securing competitive grants and significant financial resources. However, its performance at the international level is comparatively modest, with only about 4% of total funding originating from international sources, including four ERA-NET contracts (one as PI). This gap suggests the need for a more proactive approach to international collaborations and participation in global research initiatives.

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

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

Neuro-Dol's impact is remarkable/outstanding at the local and national level and certainly excellent at the international level, thanks to its exceptional scientific output (>400 peer-reviewed articles, 60% as PDC, mainly in the best specialty journals), and > 200 scientific talks. With its successful funding record and a well-defined and focused research strategy, the unit is positioned at the forefront of pain research in France. In addition to major commitment in national healthcare institutions (Inserm, ITMO, French pain research network...), the unit has also developed a leading position at the European level (European Academy of Neurology, European Pain Federation), which opens up opportunities for fruitful collaborations.

Context-related strengths and opportunities for the four references above

Neuro-Dol clearly defined its scientific objectives through a reverse translational strategy - from bedside to benchside (and back again): preclinical studies take insight from clinical data to identify potential mechanisms through varied animal models and advanced neurophysiological and imaging techniques, and lead to propose hypotheses, further validated by clinical studies. A key strategy is to develop both pharmacological and non-pharmacological therapeutic treatments. With this strategy, the two teams published 462 peer-reviewed original articles, among which 247 in the field of pain and pharmacological research (about 60% with first, last and/or corresponding author), 72 review articles (mainly in the field of pain) and 24 book chapters. This production, quantitatively and qualitatively excellent, includes publications in renowned specialty journals (Pain, Anesthesiology, J Headache Pain, Br J Pharmacol, Gut Microbes), neuroscience/neurology journals (Lancet Neurology, Neuron, Brain) and generalist journals (Nature Communication, PNAS).

Neuro-Dol's work led to some remarkable contributions to the field of pain by identifying interleukin-22 as new pain target in irritable bowel syndrome, by highlighting the role of serotonin receptors 5-HT₆ in neuropathic pain and proposing a novel therapeutic strategy by decoupling 5-HT₆ and mTOR pathway, by identifying the connectivity of the retrosplenial cortex as a biomarker for neuropathic pain, by shedding light on the influence of hormonal status on migraine, by proposing a role for the locus coeruleus in migraine chronification, by revealing a critical role of potassium channels Kir4.1 in astrocytes in inflammatory facial pain and by proposing a therapeutic potential of targeting these channels.

The dissemination of Neuro-Dol expertise is ensured by a very active participation in scientific, especially pain-specialized, meetings with 222 talks in national congresses and 93 conferences in international congresses, in addition to numerous poster presentations.

Neuro-Dol's excellent recognition in the field of pain is reinforced by a very active participation in the community at national and international levels. Indeed, the unit hosted the International Headache and Pain symposium in 2022, with prestigious invited scientists, and, besides coordinating the French pain research network, members of the unit took part in the organization of about 15 scientific manifestations (congresses of the SFPT, SFETD, JNLF, EFIC, etc.). Eight unit's researchers are members of editorial boards of scientific journals as Associate Editors and Review Editors (Pain, Front Pharmacol, Pain Res, Front Mol Neurosci, Eur J Pain, etc.). The unit also includes several members of research steering bodies or scientific experts at European (European Academy of Neurology, European Pain Federation), national (Inserm CSS4, French pain research network, Haute Autorité de Santé, ANSM, CNU, SFETD, SFPT) and local (University steering bodies, dean of the faculty of medicine) levels.

The unit takes adequate action to ensure scientific integrity ("Training in research ethics and scientific integrity", "Rights and Duties of Doctoral Students" form, use of data management and processing plan) as well as traceability and reproducibility of its results (systematic use of the electronic laboratory notebook selected by Inserm, locally hosted shared cloud storage of active raw data and metadata). The unit applies a policy toward open science by referencing all publications on HAL, in addition to favouring open access whenever it is possible. The dissemination of results is discussed among staff members, some of them having editorial responsibilities in leading journals in pain field, and authorship is given following national and international general recommendations. As a consequence, all unit's current members have been co-authors of publications in the last five years.

The unit takes action to guarantee ethical standards in research on human subjects. Two PI ensure the application of French and international regulations, including the adequate level of legal training and skills in research. In addition, the unit follows the ethical guidelines of the International Association for the Study of Pain. As for studies on human subjects, the team's clinicians work with clinical research assistants (ARC) to ensure the respect of legal and ethical regulations.

Context-related weaknesses and risks for the four references above

The part of European grants in the unit's resources remains limited (4% of the total funding). While the level of the total funding may be large enough for the unit's need, access to European grants would contribute to increase Neuro-Dol impact internationally.

The level of clinical publications with human subjects does not reach that of publications on preclinical studies on animals (in vivo and/or in vitro). In addition, despite the will in the unit's strategy to favour reciprocal interactions between clinical and preclinical studies, it does not yet translate into publications addressing a scientific question in both animal and human, this delay being partially due to the different temporality in the two approaches.

While the unit regularly publishes in highly ranked specialty journals and contributes as co-authors to articles in high-profile generalist journals (representing about 10% of its publication record), publications in top-tier generalist journals where Neuro-Dol members serve as corresponding authors remain rare.

The unit consists primarily of researchers and students from the Clermont-Ferrand region but faces challenges in attracting a larger number of external or international researchers. Given the excellent quality of research within the team, this situation is unexpected and deserves closer examination. Enhancing international visibility and implementing targeted strategies to promote mobility and foster collaborations could significantly improve the unit's attractiveness.

EVALUATION AREA 3: INCLUSION OF RESEARCH ACTIVITIES IN SOCIETY

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

The unit demonstrates outstanding engagement with the socio-economic and cultural landscape.

Neuro-Dol collaborates closely with local (Institut de Chimie de Clermont-Ferrand, CHU...), national, and international academic (McGill, King's College...) or industrial partners (Nestlé, VitroBio, GreenTech...), driving cutting-edge research in the field of pain - both through pharmaceutical innovation and clinical studies aimed at improving patient care. These collaborations are genuinely reciprocal, with several doctoral projects receiving direct support from non-academic partners.

In partnership with industry and societal stakeholders, Neuro-Dol actively promotes research valorization, ensuring intellectual property protection through strategic patenting (n=7).

The researchers share their expertise widely, contributing to specialized scientific conferences and publishing therapeutic guidelines that shape best practices in pain management. This recognized expertise positions Neuro-Dol as a key contributor to national and international public health initiatives. The unit is partially hosted and obviously maintains strong links with the Université Clermont Auvergne. Several members of Teams 1 and 2 share teaching responsibilities in common course units, such as the Physiopharmacology of Pain course in Master 1, Neurosciences in Master 2, or the Pain course taught to students enrolled in the "parcours d'accès spécifique santé (PASS)" and the "licence "accès santé" (LAS). The Unit was involved in the development of a teaching tool for all health students within the Flexisanté program. Finally, the unit is deeply committed to science outreach, engaging with the general public through media appearances, educational programs in schools, and participation in major science events—making cutting-edge research accessible to all.

Context-related strengths and opportunities for the three references above

Between 2020 and 2026, the unit has shown sustained engagement with societal stakeholders and knowledge dissemination, becoming a reference in pain research and public health.

The unit demonstrates a strong commitment to research valorisation and knowledge transfer, ensuring that scientific advances translate into societal and economic benefits. This proactive approach has resulted in seven patent submissions and active participation in the creation of the startup *Novesia*, exemplifying its capacity to foster innovation and contribute to the regional and national innovation landscape.

The unit stands by its strong involvement in teaching (pain courses for dental students, master of physiopharmacology, >90% of the PI with teaching duties), student mentoring (> master students, 57 PhDs trained by 31 PIs holding the HDR), national training investment (Translational research School of Pain).

Nationally, it contributed to Inserm expertise on fibromyalgia, pain management in disabled and elderly populations, and migraine. In collaboration with ARS AuRA, it coordinated the Action for Pain Management in People with Multiple Disabilities, developing educational tools (HANDOL, VISIODOL) and a neuropathic pain program for the elderly (2023–2026). At Anses, it contributed to the re-evaluation of desphenyl-chloridazone in drinking water. At ANSM, a member coordinated the national medical cannabis trial (2021–2026), while another contributed to HAS on chronic pain pathways and treatment evaluation. Neuro-Dol is also strongly involved in patient care and design of guidelines (the Observatoire français de la douleur et des antalgiques) but also through clinical research studies (n=8) such as Lantéri-Minet et al. *J Headache Pain* 24, 152.

The unit demonstrates an outstanding commitment to public engagement and knowledge dissemination, actively participating in local and national events designed to popularize science, such as Brain Awareness Week, the Science Festival "Fête de la science", Pint of Science, and an upcoming exhibition at the Bargoin Museum (2024). Its outreach efforts include media appearances and initiatives led by the AUVERBRAIN association, which reach between 1,500 and 2,000 participants annually and organize creative programs like the Art and Brain competition for primary schools. Notably, the development of a dedicated website on pain and cancer further underscores the unit's proactive approach to education and public awareness.

In summary, the quality of the research conducted at the Neuro-Dol Unit and its strong involvement have contributed to national and international visibility that extends beyond the field of research. The unit is supported by the Université Clermont Auvergne and the university hospitals of Clermont-Ferrand. Bolstered by this visibility, the unit's members are particularly active and creative in their interactions with the local and national cultural and socio-economic spheres. They are involved in expert activities, but also in communication with the general public.

Context-related weaknesses and risks for the three references above

One can hardly identify weaknesses when examining the unit's social, cultural and economic investment in the Clermont-Ferrand region and beyond. The university teaching load can sometimes be heavy for some members of staff, but this involvement in training also contributes to the team's visibility and attractiveness.

To maximize the impact of innovation, it would be desirable for patents to result in licensing agreements, fostering technology transfer and potential industrial partnerships.

ANALYSIS OF THE UNIT'S TRAJECTORY

The objective clearly stated in the report is to maintain a robust research activity in the field of pain and thereby, to remain positioned as a leading research centre in this topic in France. This research centre has therefore sought to preserve its existing strengths, which are grounded on a combination of fundamental and clinical research on pain. Running research in these two complementary areas are made possible thanks to the involvement of clinicians, clinician-researchers and fundamental researchers pursuing activities spread across laboratories and hospitals in the city of Clermont-Ferrand. The two teams will thus continue their research in topics defined several years ago (four themes in extracephalic pain research that actually remain very similar and four themes in cephalic/trigeminal pain research).

Two major challenges lie ahead for the Unit:

The first is the integration of an additional research team. During the previous period, the Unit had administratively suppressed one of its teams, which had become too small. Most members of this team were reassigned to the two remaining teams. By 2027, a new 'third' team will be integrated into the unit, with the perspective to further expand research by approaching pain from a more systemic angle and with a stronger neuropsychiatric focus. This team will bring to Neuro-Dol a group of researchers and collaborators already based in Clermont-Ferrand in the EA 7280 team (based in the neurology and psychiatry/addictology departments of Gabriel Montpied hospital), entitled 'Neuropsychopharmacology of subcortical dopaminergic systems. The stated objective of this new expansion of the unit is to welcome complementary expertise that will broaden pain research in neuropsychiatric contexts. This involves the integration of both thematic expertise (in the fields of Parkinson's disease, psychiatric disorders and addiction) and methodological expertise (neuroimaging, neurostimulation).

The second challenge will be to advance current research towards new emerging scientific insights and technological innovations. The objective is to integrate tools of artificial intelligence for behavioural analysis, developing organoid models using human tissue, and to incorporate advancing computational neuroscience for preclinical studies. There is also a strong wish to reduce the use by developing artificial intelligence assisted procedure for clinical research and leveraging advances in the use of human induced pluripotent stem cells to be studied in dedicated research platforms.

Furthermore, expanding clinical research seems a goal for the next contract as well, particularly in the FHU Translational Pain and Headache research and the new CIC project where Neuro-Dol members will be major actors.

The integration of the third team will undoubtedly broaden the unit's expertise and increase the diversity of projects and pathologies addressed. However, this expansion also introduces a risk of dispersion, which must be carefully managed to maintain focus and foster internal collaboration on common objectives. The unit has already taken steps to mitigate this risk by highlighting several joint initiatives involving Team 3, such as studies on comorbidities between migraine and bipolar disorder (Teams 2 & 3), the incidence and prevalence of chronic pain in Parkinson's disease (Teams 1 & 3), and inflammatory profiling in migraine patients with psychiatric comorbidities (Teams 2 & 3).

Another challenge lies in the physical dispersion of the teams across two university hospitals. To strengthen cohesion and encourage regular interaction, the unit should consider implementing measures such as organizing frequent joint seminars, annual retreats, and other collaborative events that bring all teams together.

The committee considered the project presented by Neuro-Dol to be highly interesting and promising, a view reinforced by the unit's recent success in securing four ANR projects in 2025 (including one as principal investigator), totalling €1.5 million. This strong funding base provides an excellent foundation for launching most of their innovative research initiatives.

RECOMMENDATIONS TO THE UNIT

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

The main suggestions in terms of governance and human and financial resources would concern the following points:

Ensure that the Neuro-Dol unit becomes more attractive to national and international researchers from further afield. In particular, consideration could be given to identify and address the internal and external factors that reduce this attractiveness. Try to increase time dedicated to research for clinicians for example, through "Contrats de Recherche Hospitalier".

The unit must continue its strategy of obtaining European funding, which would consolidate the unit's international visibility and further promote its profile. Similarly, publishing research results in generalist journals can also help to increase visibility and international impact.

Finally, the recent change in the unit's management and its successful reorganization into three teams will likely present a significant challenge. It is crucial to ensure that the integration of a new team does not result in a mere juxtaposition of research activities, but instead fosters genuine synergy and delivers added value for all parties involved. Care must be taken not to disrupt the excellent working atmosphere that currently exists within the unit. Maintaining a shared decision-making process and ensuring clear, effective communication will be essential. Hence, the leaders of Neuro-Dol and the three teams are encouraged to draft and maintain an archive of major decisions (meeting minutes).

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

The unit should put a major effort on maturing its translational strategy into robust publications combining with clinical human research. Targeting high-profile generalist journals would improve the unit's international visibility and increase its chances of obtaining European funds.

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

The strong commitment to research valorisation has led to patent submissions and the creation of a startup demonstrating its innovation potential. To maximize impact, it is recommended that the unit actively pursue licensing agreements to exploit these patents and strengthen technology transfer.

TEAM-BY-TEAM ANALYSIS

Team 1: Fundamental and clinical pharmacology of pain

Name of the supervisor: Mr Jérôme Busserolles

THEMES OF THE TEAM

The team is joining clinicians and basic science researchers to study the pathophysiology of pain with a particular focus on fundamental and clinical pharmacology. Four axes corresponding to four subgroups are developed: 1) Pain Therapeutics, joining mostly clinicians, 2) Cancer pain, joining researchers and two clinicians, 3) Molecular and cellular pain modulators joining researchers and one clinician, 4) Microbial metabolites and chronic pain, joining researchers and one clinician. Their main goal is to generate new knowledge to improve the management of pain.

CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Three main recommendations were made in the previous report: (i) improve the visibility of publications in the clinical field, (ii) increase the number of full-time permanent researchers and improve parity and (iii) to refocus its questions on the improvement of pharmacological strategies for pain management (axis II) through better knowledge of current treatments and the exploration of new therapeutic targets and secure funding for certain subproject in axes I and II.

Although the first recommendation was clearly addressed during the past five years with several clinical papers published in high impact journals and an increase of invited communications of several of the clinicians and researchers involved in these studies, progress concerning the two other recommendations are still questionable. The parity in the team has clearly improved (16 women/21 men) in the permanent staff with several women heading health departments and the career of several women have been promoted during the last six years but no noticeable progress has been made to increase the number of full-time permanent researcher. Concerning the last recommendation, the team has been successful in securing funding for its projects, but the organization into four axes and multiple sub-axes still gives an impression of dispersion. It should nevertheless be noted that this reflects, at least in part, the richness of the team's work and the consolidation of areas that have proven effective in recent funding calls.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	7
Maitres de conférences et assimilés	13
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	11
Praticien hospitalier	1
Sous-total personnels permanents en activité	33
Enseignants-chercheurs et chercheurs non permanents et assimilés	5
Personnels non permanents d'appui à la recherche	0
Post-doctorants	0
Doctorants	12
Sous-total personnels non permanents en activité	17
Total personnels	50

EVALUATION OF THE TEAM

Overall assessment of the team

Team 1 is an outstanding multidisciplinary team, including clinicians and basic researchers. Its scientific output is excellent, featuring numerous publications in top specialized and generalist journals (>200 articles, 13/PI, including 129 in pain research, 64% in PDC). The team's clinical research is strong both in quality and quantity, it maintains active national and international collaborations and demonstrated strong fundraising ability (>8M€ including 3 Eranet Neuron and 5 novel ANR). Team 1 also filed 6 patents, developed tools for pain evaluation (Colibri) and developed partnerships with several companies (Novesia, GreenTech,...). In the future, the recruitment of new postdoctoral researchers and full-time permanent scientists will constitute a major strategic objective aimed at enhancing the research activities conducted within the team.

Context-related strengths and opportunities

Team 1 is a large group comprising 50 members (33 permanent and 17 non-permanent staff), characterized by a remarkable mix of clinicians and fundamental researchers, with clinicians being largely predominant. The scientific production is excellent (n=129 peer-reviewed publications) with many original publications in first and/or last author (64%) in top specialized journals (Pain, Gut Microbes, Brain Behavior and Immunity, Biomedicine and pharmacotherapy, British journal of pharmacology) as well as several publications in collaboration in generalist journals (Nature Neuroscience, PNAS). In particular, team 1 research identified a bacterial strain reducing visceral hypersensitivity and inflammation in collaboration with GreenTech and demonstrated a link between a constitutive activation of 5HT₆ receptors and the mTOR signalling pathway in neuropathy (Progress Neurobiol 2020 and a registered patent).

Publications in clinical research area (n=80) are also quantitatively and qualitatively excellent and clinicians in the team were involved in the coordination of different national programs (First national chronic pain patient cohort, national experimental program on medical cannabis, Pain management program for disability and elderly populations). The team is involved in several networks and collaborations at the national and international levels and welcomed more than twenty scientists from abroad demonstrating its scientific dynamism. Members of the team, including PhD students, actively participated to numerous national and international meetings including IASP, EFIC and SFETD meetings where they presented their work via oral communications (n=105) or posters. The team demonstrated a strong capacity to raise funds to develop its different research axes, particularly at the national level from public funding (ANR, PHRC, Inca, IUF), charities (FRM, AFM telethon...) and private companies, and has improved its capacity to secure European funding (3 ERA-Net Neuron projects, 1 FEDER grant) for a total of 8.4M€. Team members are participating to institutional committees including Inserm, CNU, ANSM and to scientific councils of national and European institutions (EFIC, SFETD, SFPT). Team 1 is also involved in interactions with the socio-economic environment with the filing of six patents and collaborations with different companies (ANS Biotech, Domiconus, Novesia,...). The team also developed a digital tool for chronic pain evaluation (Colibri). The creation of a dedicated web page for cancer and pain is also a demonstration of their public engagement towards knowledge dissemination. Finally, the access to human (clinical investigation centre) facilities as well as technical platforms from UCA with a dedicated staff, together with the involvement of team members in the next technological development represent interesting opportunities for the future.

Context-related weaknesses and risks

A major weakness of Team 1 lies in the limited number of full-time researchers (one Inserm researcher) and postdoctoral fellows. This situation places considerable pressure on senior lecturers and professors, who already face heavy teaching and clinical responsibilities. The team members themselves identify the heavy teaching load as a structural weakness. Although they remain confident in their ability to balance their academic duties with a strong commitment to high-quality research, this situation nonetheless creates a significant risk. In the long term, such sustained pressure may compromise their research productivity and limit their capacity to maintain the expected scientific momentum.

Despite commendable efforts to streamline research themes and reduce the number of molecular targets, Team 1 remains relatively fragmented, with four main axes and numerous sub-axes. This dispersion likely contributes to the limited number of publications in high-impact, generalist journals. On the technology transfer side, six patents have been filed but no license agreements have been executed to date, which might be explained by their recent registration. At this stage, there are no active industry collaboration agreements to translate industrial valorisation into concrete outcomes, such as developing therapeutic tools based on the filed

patents. Moreover, it is regrettable that neither UCA nor Inserm Transfer appears to provide enough internal maturation support. This situation increases the risk that promising intellectual property will remain insufficiently advanced for industrial uptake. The team is fully aware of the challenge of dedicating sufficient time and resources to valorisation activities, yet this limitation may ultimately hinder the translation of their research into concrete industrial and therapeutic outcomes.

The main risk, partly stemming from the weaknesses discussed above and the decline in recurrent funding (although affecting all research teams in France), is a potential decrease in the team's attractiveness to talented researchers and strategic partners.

ANALYSIS OF THE TEAM'S TRAJECTORY

The project is excellent and well-argued, drawing on the team's expertise in pain pharmacology, which is recognised by national and international authorities, on long-standing preclinical and clinical interactions, and on a clear desire to promote basic research on the basis of clinical research and engage in clinical studies to validate hypothesis from basic results. The team also describe a clear willing to be involved in technology transfer in order to develop new pain therapies. The proposed project is structured according to four axes that were defined and organized during the previous period (i) Pain Therapeutics axis that gather mainly clinicians; (ii) Cancer Pain axis that addresses both clinical and fundamental aspects of cancer pain; (iii) Molecular and cellular pain modulators axis that focuses on fundamental research questions in the field of chronic pain; and (iv) Microbial metabolites and chronic pain axis.

Despite the reorganisation of the team (based on the previous Hcéres report) to refocus its work on a limited number of targets, the risk of dispersion still remains. The existence of four main research axes, each further subdivided into multiple sub-axes, raises concerns regarding the possible diffusion of efforts and resources across an excessive number of projects. Furthermore, the presence of only one full-time researcher and the absence of postdoctoral fellows constitute significant obstacles to the effective and coherent advancement of the team's scientific objectives. The current organizational structure of the team appears closer to that of a research unit comprising multiple independent groups pursuing distinct projects, rather than that of a cohesive team focused on a restricted number of well-defined scientific questions, collectively addressed through the complementary expertise of its members.

On the technology transfer side, the team's organization appears well designed to enable a rapid transition of therapeutic innovations to the patient's bedside. However, none of the six patents filed by the team during the previous period have been yet licensed, suggesting that a gap still exists between discovery, patenting, and clinical translation. This may be explained partially by the recent patenting, however.

Several new funding sources, including two industrial contracts and 3 ANR 2025 (as partner), have already been secured, providing a solid foundation for a promising start to the forthcoming period.

RECOMMENDATIONS TO THE TEAM

To strengthen the team's research capacity and achieve its scientific ambitions, it is essential to increase the number of full-time researchers and postdoctoral fellows. This expansion will ensure efficient execution of ongoing projects while fostering new, more ambitious and interdisciplinary lines of inquiry.

The establishment of one or two cross-cutting initiatives that bring together the skills and expertise of the various sub-teams would create a unifying framework to address fundamental questions in pain research. Such integration would significantly deepen the scientific quality and originality of the group's work, increase the visibility of its results in high-impact journals, and promote stronger internal cohesion that in turn would enhance attractiveness and international recognition of the team.

In parallel, building partnerships with private-sector actors interested in the therapeutic applications of the team's discoveries could accelerate the transfer of knowledge into practice. To succeed in these endeavours, reinforced support from UCA or Inserm will be crucial, particularly in facilitating technology transfer and innovation.

Finally, greater active participation in major international neuroscience events, such as SfN and FENS, will raise the team's global profile, open new recruitment channels for postdoctoral researchers, and contribute to the long-term excellence and competitiveness of the research group.

Team 2: Trigeminal pain and migraine

Name of the supervisor: Mr Radhouane Dallel (Future team leaders: Mr Xavier Moisset & Ms Lendaic Monconduit)

THEMES OF THE TEAM

Team 2 is composed of clinicians, academics, and an Inserm researcher whose objective is to use basic, pre-clinical and clinical research to study the pathophysiology of Trigeminal Pain and Migraine. The originality of the team is that it combines dentists, neurologists, anaesthetist, otorhinolaryngologist, rheumatologists and maxillofacial surgeons, as well as neuroscientists and mathematicians. The team developed three main research themes: 1) Physiology and pathophysiology of mechanical pain, 2) Pathophysiology of migraine, 3) Therapeutic and technological advances. The main objective of the team is to dissect out the cellular and molecular mechanisms of trigeminal pain and migraine in order to implement new treatment strategies.

CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The team considered and responded to the three main recommendations raised by the previous Hcéres committee:

1) Integration of different approaches: the team implemented a multidisciplinary translational research strategy, integrating advanced neurophysiology and imaging techniques (multiphoton and endoscopic microscopy, fiber photometry, opto- and chemo-genetics), as well as approaches using viral vectors. Strong links between preclinical and clinical research were established through collaborations, enabling direct comparisons between human and data. The development of functional Manganese-Enhanced Magnetic Resonance Imaging (MEMRI) and transcranial direct current stimulation (tDCS) in rodents further reinforces the translational scope of the group's work. In terms of publications, during the last mandate the team has succeeded in targeting high-visibility journals (Lancet Neurology, JAMA Neurology, Nature Communications, Brain, Pain, etc.).

2) Work force: the team took proactive measures to anticipate retirements and strengthen human resources. New academic members were recruited, but notably, no yet full-time researcher. Technical support has also been strengthened, with new permanent and non-permanent contract employees ensuring solid operational capacity.

3) Regarding the project, the team has broadened its research areas through strategic collaborations within the Neuro-Dol unit and with international partners, while maintaining a consistent scientific focus. New avenues of research revolve around the contribution of glial and myeloid cells, and the influence of gender and hormonal status on pain mechanisms.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	10
Maitres de conférences et assimilés	8
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	1
Personnels d'appui à la recherche	7
Praticien hospitalier	3
Sous-total personnels permanents en activité	29
Enseignants-chercheurs et chercheurs non permanents et assimilés	3
Personnels non permanents d'appui à la recherche	0
Post-doctorants	1
Doctorants	11
Sous-total personnels non permanents en activité	15
Total personnels	44

EVALUATION OF THE TEAM

Overall assessment of the team

As a large multidisciplinary group, team 2 shows perfect adequation of its organisation with its scientific objectives. The scientific production is excellent to outstanding in the pain's field (328 publications including 134 in pain/neurology/neuroscience dedicated journals, including Lancet Neurol, Neuron or Brain, ~50% as first/last/corresponding author). The team's capacity to secure external funding is also outstanding regarding the small number of permanent full-time researchers (~7M€, 80% as PI). Team's member are remarkably involved in both the local academic tissue and the national community of pain research, which contribute to excellent attractivity and a solid international recognition. Finally, the team's contribution to science outreach toward the public and healthcare professionals is exceptional. Considering all these elements, **this is overall an outstanding team** that can still improve its valorization aspects and international recognition, however, to maintain its level.

Context-related strengths and opportunities

Team 2 is the only French group and one of the few in Europe entirely focusing on trigeminal pain and migraine. This position makes the team attractive, thanks to a remarkable blending of clinical and basic research through (1) a multidisciplinary and multiexpertise team composition with 16 clinicians (PU-PH, MCU-PH, PH) and 7 scientists (PU, MCU, CRCN Inserm, CPJ), 3 of them having joined the team during the current contract, 11 PhD candidates and 2 postdocs, also from both scientific and health backgrounds, and 7 supporting staff; (2) an unique environment for fundamental and translational pain research and education with the premises in faculty of dentistry and access to platforms and clinical services; (3) a central role in the landscape of pain research at local (hospital, university, AuRA region, private companies, social ecosystem), national (creation and coordination of the French Pain Research Network, involvement in SFETD, about 20 collaborators in France with joint publications) and international (about 20 collaborations in and outside Europe with joint funding and publications, involvement in EFIC, organization of the International Headache and Pain Symposium 2022).

Scientific production is excellent, quantitatively, with 328 publications including 252 original articles, among them 134 in the pain field (61% in first, last and/or corresponding author), which represents almost the double compared to the previous contract, and, qualitatively, by publishing in leading journals in the field of pain (J Headache Pain, Headache, Pain, Eur J Pain, Cephalgia), neuroscience journals (Brain, Adv Neurobiol) and generalist journals (Elife, Curr Biol), including 10% of articles published in top-tier journals (Lancet Neurol, Nature Commun, Neurology, Neuron). This is well exemplified by their recent publication on the role of hormones in pain via Kir4.1 channels, and the beneficial effect of ketamine magnesium in cluster headache.

The profile of the new recruits (computational neuroscience, neuromodulation, neuroimaging) and the planned development of an organoid platform at UCA are excellent opportunities to strengthen the quality of the team's scientific production.

The team's capacity to raise funding is excellent, especially from public funds locally (2439 K€; Clermont university and hospital, AuRA region) and nationally (2198 K€; ANR, ANR JCJC, CPJ, Inserm, PIA), completed by private companies, foundations and charities and international funding (1460 k€ as PI).

The team's participation in its research and clinical community and its contribution toward the society is exceptional. Besides the position of team members in editorial boards (Eur J Pain, Pain reports, Front Mol Neurosci..) and in research/teaching steering bodies at European (EAN, EFIC), national (Inserm CSS4, CNU) and university (central councils, faculties of medicine and of dentistry) levels, the team has contributed to the organization of 21 scientific events towards healthcare professionals, and to the development of French and international guidelines on pain (11 publications). Finally, team 2 is very active in participating in diverse science outreach events (n=60) aimed at the general public and schools (Brain week, science festival, Pint of science, Art and brain competition, etc.), thanks to the AUVER-BRAIN association, created by a team member.

Context-related weaknesses and risks

Team 2 hosts a single full-time researcher besides 22 teacher-researchers with heavy clinic and/or teaching duties. While the dynamism of all team members appears sufficient to sustain excellent scientific output, the absence of additional full-time researchers represents a structural risk. It may ultimately limit the team's competitiveness in securing high-impact publications and external funding, particularly by reducing their capacity to engage in ambitious translational research projects.

In addition, the low number of postdoctoral fellows (4 recruited during the contract, 2 currently) reduces the workforce and the opportunities to bring forward solid candidates for researcher (CRCN) competition.

Beyond the remarkable scientific output that has resulted in an increased number of high-quality publications, the proportion of articles appearing in high-profile generalist journals has indeed improved, yet it remains relatively modest. In addition, while the combination of fundamental scientists and clinicians is one of the team's strengths, the production of robust publications combining preclinical research with clinical human research is still limited.

Valorisation activities could be further strengthened. The team has filed only one patent to date (Pyridin-2(1H)-one derivatives for treating mechanical allodynia), which has not yet been licensed, as well as one e-SOLEAU declaration for a questionnaire assessing allodynia and associated symptoms in migraine patients. Nevertheless, industrial collaborations are comparatively better developed, indicating a promising potential for future translational impact (VitroBio, Strainchem, Pharmaleads,...).

ANALYSIS OF THE TEAM'S TRAJECTORY

The project is excellent and well-articulated on the basis of the current team's organization and scientific endeavours. The next five-years project is structured following 4 main axes: (1) Neuroplasticity in pain pathways and networks, expanding the previous axis focused on mechanical pain and essentially conducted in preclinical models, but also cultured human cells; (2) Pathophysiology of migraine, continuing the long-lasting expertise of the team on the topic in human, but with a focus also shifted on non-neuronal cells (immune system, myeloid cells, satellite cells, astrocytes) in addition to the ongoing evaluation of the hormonal impact and the key-role of locus coeruleus; (3) Innovative approaches to pain management and (4) Patient phenotyping, these two axes constituting a new iteration of the previous axis on therapeutic and technological advances, by focusing essentially, but not exclusively, on clinical studies, to explore non-pharmacological therapeutic strategies such as neurostimulation or hypnotic induction, and to identify predictive factors for chronic pain. Notably, several projects will be conducted as intra-unit collaborations with teams 1 and 3, as well as national or international collaborations, based on a robust set of partnership with leading pain groups in France (Paris, Lyon, Bordeaux, Toulouse) and internationally (Germany, Denmark, Spain, UK, Canada, Chile).

The team's workforce in 2027 will be essentially identical to that of the current team (30 permanent staff), thus with complementary scientist/clinical profiles and preclinical/clinical expertise, but also a lack of a significant force as full-time researchers and postdocs. On the other hand, the project will benefit from the recent recruits by the development of new approaches (neurocomputational methods, neurostimulation, etc.).

Part of the financial resources for the next contract is already secured by current funding extending beyond 2027, in addition to recent success in securing six new funding sources (including a European grant from the 2025 NEURON call on Interdisciplinary Approaches to the Neuroscience of Pain) covering the period until 2028-29.

RECOMMENDATIONS TO THE TEAM

The current efforts to present candidates for full-time researcher positions should be pursued. In parallel, the recruitment of postdoctoral fellows, especially those trained outside of the local community, should be actively sought to attract potential candidates able to bring a new dynamic.

The level of publications, including in high-profile generalist journals, could be improved by bringing to fruition translational works combining animal and human research. From this point of view, it is recommended to expand intra-unit collaborations.

Finally, the further development of interactions with industrial companies and start-ups is recommended to boost the valorization of the team's research.

Team 3: New Team 3 – Transonographic approach in pain and neuropsychiatry

Name of the supervisors: Mr Ludovic Samalin & Ms Ana Marques

THEMES OF THE TEAM

Team 3 is a novel component of the Neuro-Dol unit, which proposes a global approach of pain in neuropsychiatric diseases. The rationale for such approach is based on the observation that psychiatric and neurological disorders, such as bipolar disorder and Parkinson's disease share several clinical features (for example pain, adynamia and hallucinations), which are most often studied separately and seldom transonographically. As such, the team proposes a global approach of pain in neuropsychiatric diseases based on accurate phenotypic pathophysiological characterization.

CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

Nor applicable as this is a new team.

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

Catégories de personnel	Effectifs
Professeurs et assimilés	9
Maitres de conférences et assimilés	0
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	8
Praticien hospitalier	6
Sous-total personnels permanents en activité	23
Enseignants-chercheurs et chercheurs non permanents et assimilés	
Personnels non permanents d'appui à la recherche	
Post-doctorants	
Doctorants	
Sous-total personnels non permanents en activité	0
Total personnels	23

EVALUATION OF THE TEAM

Overall assessment of the team

Not applicable as this is a new team, partially coming from the EA7280.

Context-related strengths and opportunities

Not applicable

Context-related weaknesses and risks

Not applicable

ANALYSIS OF THE TEAM'S TRAJECTORY

Team 3 will be a novel component of the Neuro-Dol unit, which proposes a global approach of pain in neuropsychiatric diseases. Part of this team was previously involved in EA7280 named "Neuropsychopharmacology of Dopaminergic system" from UDA. This team is located in the Neurology and Psychiatry departments of the Dunand site.

For the upcoming contract, the team will be led by a psychiatrist and a neurologist with a strong expertise in their field, especially bipolar disorders and Parkinson's disease, respectively. They have already conducted several clinical studies on pain and hallucinations in Parkinson's disease (Marques et al. Parkinsonism and related Disorders, 2019; Marques et al. Journal of Parkinson's disease, 2021) and on the occurrence of a specific migraine phenotype in subjects with bipolar disorder (Samalin et al. Journal of Affective Disorders, 2025).

The projects is ambitious, multi-parametric (imaging, questionnaires, microbiota, sleep, pain...) and multi-pathologies (Parkinson, Bipolar disorder, Tourette syndrome, Schizophrenia, Rest-leg syndrome) and not only focusing on pain.

The assembled team has a strong expertise in clinical and clinical imaging research. The team can rely on these expertises as well as on large cohorts to achieve their objectives. However, it is suggested to reinforce the team by recruiting more technical staff and by securing more ambitious funding (national and European).

The research theme is definitely original with only a few research teams worldwide working on this overlooked but nevertheless important subject. The team has access to large clinical cohorts of subjects with Parkinson's disease (NS-Park network) and psychiatric disorders (FACE) and to cutting-edge imaging facilities.

The team will need to remain vigilant on several points, however. Firstly, the team's current composition is primarily hospital practitioners (n=13), with only one tenured full-time researcher and two research engineers. This could be seen as a weakness, particularly for designing in vitro studies. Another key aspect is that the research axes are a bit scattered covering a wide range of neuropsychiatric disorders and their associated symptoms (the rationale for these studies is clear and can be understood, but the feasibility is less convincing).

RECOMMENDATIONS TO THE TEAM

It may be recommended to focus research on more central axes. This applies not only to diseases (focusing on bipolar disorder and Parkinson's disease for example rather than studying 'various neuropsychiatric conditions') but also to the clinical features (focusing primarily on pain instead of studying a wide range of neuropsychiatric symptoms). Additional technical staff should be recruited, and it is suggested to apply to more competitive grants (national-ANR and European-ERANET-JPND or equivalent).

CONDUCT OF THE INTERVIEWS

DATE

Beginning: 05 November 2025 at 08:30

Ending: 05 November 2025 at 19:00

Interview conducted: on-site

PROGRAMME OF THE INTERVIEWS

8:30-8:50	Welcome coffee (closed-door): Visiting committee with the Hcéres advisor (Salle cours 1, niveau 2)
8h50-10:00	Presentation of the evaluation process and the unit scientific outputs (Salle Gradinée 1, niveau 2)
8:50-9:00	Presentation of the evaluation process to the unit by the Hcéres advisor
9:00-10:00	Presentation of the unit scientific outputs and strategy by the current and future lab directors Radhouane Dallel/Nicolas Authier (35' presentation + 25'discussion)
10:00-10:20	Coffee break (Hall, niveau 0)
10:20-11:00	Visit of the local facilities and unit
From 11:00	Meetings with the various categories of staff (closed door) (Salle Gradinée 1, niveau 2)
11:00	Discussion with PhD students and post-docs
11:30	Discussion with scientists (without team leaders)
12:00	Discussion with engineers, technicians and administrative personnel (in French)
12:30	Discussion with the team leaders (excluding directors and deputy directors)
13:00-14:30	Lunch (closed-door with the committee and Hcéres advisor) Committee Buffet (Salle cours 1, niveau 2) Unit: Hall, Niveau 0
14:30-16:00	Presentation of the research results by group leaders (Salle Gradinée 1, niveau 2)
14:30	Jérôme Busserolles (15' presentation, 15' discussion) Team 1 – Fundamental and clinical pharmacology of pain
15:00	Radhouane Dallel (15' presentation, 15' discussion) (Future team leaders: Xavier Moisset & Lenaïc Monconduit) Team 2 - Trigeminal pain and migraine
15:30	Ludovic Samalin & Ana Marques (8' presentation, 7' discussion) New Team 3 – Transonographic approach in pain and neuropsychiatry
15:45-16:15	<i>Coffee break</i> (Salle cours 1, niveau 2) (only committee members and Hcéres Scientific advisor)
16:15-17:15	Debriefing (only committee members and Hcéres Scientific advisor)
17:15-17:45	Discussion with the representative of the managing bodies (closed-door) & local representatives (Salle cours 1, niveau 2 with visioconference) Université Clermont Auvergne: V Prevot, VPR, JM Lobaccaro Inserm: D Vivien, D Pella
17h45-18h00	Discussion with representatives of the CHU (Salle cours 1, niveau 2) Pr A Buisson, & X Bijaye
18:00-18:25	Discussion with the current and future directors (closed-door)

18:25-18:40	Discussion with the future director (closed-door)
18:40-19:00	Debriefing (only committee members and Hcéres advisor)
19:00	End of the visit

GENERAL OBSERVATIONS OF THE SUPERVISORS

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

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



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