



Report on the evaluation of the Department of Infection and Immunity (DII) at the Luxembourg Institute of Health (LIH)

**Based on a peer review as commissioned by the Ministry of
Higher Education and Research of Luxembourg**

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1. Introduction

The Ministry of Higher Education and Research (MESR) of Luxembourg mandated *Interface Policy studies Research Consulting*, Switzerland, to organise and lead a research evaluation of the Centres de Recherche Publics (CRP).

The Grand Duchy of Luxembourg operates three non-university public research and technology institutions. They are the Luxembourg Institute of Science and Technology (LIST), the Luxembourg Institute of Health (LIH) and the Luxembourg Institute of Socio-Economic Research (LISER). The three CRPs include research departments linked to different scientific disciplines. The evaluation focused on the research performance of the CRPs' research departments.

The research evaluation was conducted in 2022 and followed two earlier evaluations carried out in 2012 and 2018.¹ This report presents the evaluation of the Department of Infection and Immunity (DII) of LIH.

The observations and recommendations presented in this report are based on a peer review by the following three experts working in the departments' research fields:

- Prof. Dr. Rudi Beyaert, Professor and Associate Science Director of the Center for Inflammation Research, Ghent University - VIB, Belgium
- Dr. Silvia Monticelli, Group Leader Molecular Immunology, Institute for Research in Biomedicine, Università della Svizzera italiana, Switzerland
- Prof. Dr. Thea Kølsen Fischer, Professor in Public Health, Virus Infections and Epidemics, University of Copenhagen, Denmark

The peer review consisted of a self-assessment report written by the DII and a hearing at the department that took place in August 2022. The assessment period runs from 2018 to 2021. The hearing, which was organised and moderated by Interface, comprised a presentation by the department, a group discussion of the self-assessment report and several individual and group interviews. These included interviews with the Head of department, research team leaders, members of the wider research staff and PhD students as well as clients and business partners. The report was finalised by Andreas Balthasar and Stefan Essig of Interface.

¹ Between 2010 and 2012, evaluations of selected departments of the former CRPs were carried out. The first full evaluation of the CRPs, which included all departments, was carried out in 2018.

The overall results of all departmental evaluations are summarised in an institute report for each CRP² and a synthesis report³. The institute report includes an assessment of the CRPs as a whole. It also summarises the findings from additional governance interviews with representatives of the management teams at the CRPs as well as a comparison between the CRPs and a foreign benchmark institute.

The report is structured into two parts: the first part discusses in detail the observations gathered by the expert team during the evaluation process. This part will focus on the input, output and outcome/impact of the research department:

- *Input* includes the preconditions for the research conducted, such as strategies, financial and human resources, infrastructure, organisation and external research, industry and other collaborations.
- *Output* includes the performance of the research department, exemplified through research and innovation results and their dissemination.
- *Outcome and impact* refer to the medium- and long-term effects as well as the relevance of the output on science, society, economy, and public administration/politics.

The second part presents the expert team's overall assessment and recommendations for further developing existing strengths and overcoming observed weaknesses.

² Grosjean, Nicolas; Balthasar, Andreas; Essig, Stefan (2023): Report on the evaluation the Luxembourg Institute of Health (LIH), Interface Policy studies Research Consulting, Lucerne and Lausanne.

³ Rieder, Stefan; Balthasar, Andreas; Haefeli, Ueli; Grosjean, Nicolas; Büchler, Chiara; Essig, Stefan; Thorshaug, Kristin (2023): Synthesis report on the evaluation of the Centres de Recherche Publics (CRP) in Luxembourg, Interface Policy studies Research Consulting, Lucerne and Lausanne.

2. Detailed results of the evaluation

2.1 Description of the research department

DII was created in 2014 by the merger of two labs. The director appointed at the time of DII's creation is still in office. Over the years, more research groups joined DII and the number of employees increased to 84 at the end of 2021. DII is structured as follows: support, including project management, and research, including two research groups active in “infectious diseases”, seven research groups in “allergy – inflammation – microbiome - metabolism”, and one bioinformatician. Research at DII is not focused on a disease as such but on the immune equilibrium, and mechanisms that maintain or reintroduce the equilibrium when preventing or treating communicable and non-communicable diseases such as allergies and cancer. DII's activities are positioned between fundamental, translational, and transversal research.

2.2 Input

2.2.1 Strategy

The experts consider DII's strategy to be innovative. They acknowledge DII's meaningful, long-term trajectory centred around the immune equilibrium that started before the evaluation period. In line with this, an overall strategy of strengthening the translational activities has been implemented. The approach of most DII members has seemingly been adapted towards this strategy, despite some evidence that translational priorities were also considered a threat, e.g. when the strategy led to research groups being combined. Passionate DII leaders connect various aspects of the continuum between immune activation and immune tolerance induction to a broad portfolio of activities. Synergies and collaborations within DII are getting stronger, many shared projects have evolved and align well with the strategy. DII demonstrates that it is “a step closer to the clinic” than four years ago.

The COVID-19 pandemic was an external shock that had a big impact on DII's ability to execute its strategy. The pandemic created a lot of extra work and opportunities, especially for DII's public outreach. Overall, the pandemic seems to have had a positive impact on DII but it has also delayed activities, as other projects did not get the planned attention, e.g. when recruiting patients for study participation.

2.2.2 Human and financial resources, infrastructure and equipment

DII has made progress on all points raised in the previous evaluation. Good examples are the introduction of a project manager and a bioinformatician onsite. Overall, the experts consider DII's human resources to be a strong asset. DII has many highly motivated and talented employees who enjoy working for the department and are highly committed.

Furthermore, the experts consider DII to be a financially healthy department. DII's activities were funded by the state block grant and third-party sources (competitive calls and contract research). In 2021, LIH block grant funding was around 5.5 million euros. Third-party financing was around 3.6 million euros, 53% of which came from the Luxembourg Fonds National de la Recherche and 29% from the public sector of Luxembourg. Other external funding, especially EU funding, was rather limited, which is seen as a missed opportunity to be less dependent on the block grant and FNR, to enable international networking and collaboration, and to increase the international visibility of both LIH and DII.

In terms of infrastructure and equipment, the experts consider DII to have excellent facilities and cutting-edge technology available. DII has introduced a number of new facilities, e.g. proteomics lab and gnotobiotic mouse facility (in conjunction with the University of Luxembourg), and expertise with the potential to improve translational activities as well as internal and external collaborations. At the same time, the national cytometry platform was successfully outsourced.

The experts have identified the following challenges:

- The decision-making process on budget-relevant decisions (e.g. for groups to leave, groups to arrive, creation of Principal Investigator [PI] levels) is not yet transparent across all levels of DII and LIH.
- The director of DII is missing a budget for strategic investments. The needs of DII's PIs for equipment have not always been evaluated fast enough which has sometimes resulted in a competitive disadvantage and frustration.
- DII's bioinformatics and biostatistics domains are understaffed and underfunded. Access to domain specialists at the LIH core facilities appears difficult, as they are in another location, and they are more likely to be contacted for second level support. A bioinformatics group that not only acts as a service facility, but also invests in research on the design and implementation of novel computational tools to analyse data from high-throughput technologies in DII groups would be most welcome. A continuous investment strategy for refurbishing the digital infrastructure is missing.
- DII gender awareness and inclusivity is not yet sufficiently developed. A specific program, e.g. for the funding of female immunologists is missing.
- There has been a significant lack of Post-Docs in many DII research groups. This might be due to a focusing of investments of many group budgets on technicians but also due to missing funding opportunities at the Post-Doc level as well as to the limit of five years after which a work contract has to become permanent, so internal candidates would already face this threshold soon after their PhD is finished. In the context of career development, preparing a plan to accommodate post-docs in the system will be important.
- DII's external funding strategy has improved, but its overall success is still limited.

2.2.3 Organisation

The experts recognise a clear organisational structure. The structures support collaboration within DII and the staff are fine with their defined roles and responsibilities. Regular meetings and retreats are held to encourage collaboration. The committees supervising and guiding the researchers and their projects are well accepted. The director of DII has succeeded in creating a supportive atmosphere. DII has provided good training and support for PhD students, creating an environment of mutual exchange and reciprocal help, with structured communication and coaching for the students. Advanced researchers also received support for their career development and were promoted. The structure of DII is ready to grow, with more groups, including labs and offices, that could potentially join.

The experts found the following challenges:

- DII is missing access to supportive structures within LIH for setting up and running translational tracks of the research activities. Many scientists lack the experience and time to connect their work with the clinical realm. They would be very interested in applications that are close to the needs of the population, but building those connections requires extra effort.

- DII has not yet built many collaborations with other departments. Upcoming doctoral programs might alleviate this issue.
- Working in research creates a lot of pressure in terms of competitiveness and reaching outcomes. DII, in common with other departments of LIH, lacks the option of a confidential contact with whom to discuss critical issues, e.g. an external psychologist.

2.2.4 External collaboration and service provision

The experts appreciate the efforts of DII to initiate scientific collaborations with other academic labs and the private sector. After some years building the necessary contacts and recognition for their work, DII now has connections to external collaborators and has started receiving investments, e.g. an EMBO-financed postdoctoral fellowship. Several of DII's PIs have ongoing scientific collaborations with labs abroad, as reflected by co-authorships on scientific publications. The COVID-19 pandemic created most collaborations in the private sector up to now, specifically in the fields of developing diagnostic tests and exchanging data. Despite a limited number of potential collaborators in biotech in Luxembourg, further connections exist to small and mid-sized companies.

The experts value the collaboration with the local university. Members of DII achieved the highest academic qualification at the university, allowing them to supervise PhD students. Furthermore, they are active in teaching pre-clinical courses at the newly-founded medical school. DII is also ready to receive Masters students in medicine.

The connection to hospitals is growing stronger, with ongoing collaborations and joint grant applications. The experts recognise that some of DII's researchers have shown strong translational activities in collaboration with hospitals. They are on their way to commercialising their inventions which have the potential to become highly relevant for patients. However, building translational structures at the partner institutions takes time, especially for educating physician-scientists like MD-PhDs.

The experts found the following challenges:

- DII only has a few public health researchers who provide evidence-based services, have important knowledge of societal needs and collaborate with WHO. Also, they rely on their uncertain role as a reference centre for measles and rubella. A dual affiliation with the Laboratoire national de santé (LNS) would alleviate the situation but this was not achieved.
- Industry collaboration has mainly been based on the proximity of industry and DII.
- The possibilities for large, inter-institutional projects and collaborations, especially in the international context, have not yet been fully exploited.
- DII and LIH do not use teaching and career development at universities as opportunities. Positions are not combined appointments, budgets are separate and key performance indicators are measured separately, which creates friction and uncertainty.

2.3 Research performance

2.3.1 Quality of output

DII's output quality in terms of scientific publications has been very good for most research groups, both in absolute and relative terms. The experts valued the standards of the publications, they fulfil the state of the art of the discipline. The topics of the publications are also well in line with the strategy of the department. The bibliometric analysis documents that the topical focus of the department appeared stable and only gradually changing during the evaluation period. Most research areas were somewhat persistent but a shift in emphasis can be observed over the years, for example, visible as a

peak for the area of “CXCR chemokine receptors” in 2019. Other research areas such as “serine and one-carbon metabolism” appear sporadically throughout the years. Overall, research areas appear mostly connected and synergetic.

The bibliometric analysis shows that DII produced research with a well above field-weighted citation index (FWCI) of 1.85. Out of all publications, 16.4% were among the 10% most-cited publications of the scientific field, and 44.8% were published in the 10% top journals. Yet, most quality and impact indicators (FWCI, share of top-10% cited and top-10% journal articles) show a slightly negative trend, indicating a focus on publication quantity (see chapter 2.3.2).

The experts are impressed by the oral and poster presentations at congresses and prizes that have been awarded to members of the department. DII has published on many aspects of its research focus and assembled interdisciplinary groups of authors from within the department and beyond. DII’s top publications showed a trend towards combining different disciplines/fields. Significant value also came from high quality cohort studies, using patient samples and combining big data and wet lab research.

2.3.2 Quantity of output

DII’s output quantity has been very good for most research groups, totalling 299 publications. According to the bibliometric analysis, the departments publication output over the evaluation period steadily increased. Considering the size of the department, this number impressed the experts, although an increasing emphasis on quality over quantity will become important in order to prevent piecemeal science fragmented across many small papers. The department also produced a substantial number of commissioned reports and to some extent books/book chapters.

DII and the business development office of LIH are collaborating, with a first output in terms of a patent getting published. Also, work to launch a spin-off is ongoing.

In 2020, the COVID-19 pandemic caused the animal facility to shut down and clinical studies to stop, creating a dip in output quantity. Also, the organisation of scientific events and participation in conferences were common before the pandemic and are now slowly coming back.

2.4 Outcome and Impact

Most important to the experts, DII’s strong media communication has been very successful in creating public awareness and visibility for DII as well as LIH during the Covid-19 pandemic. DII also directly supported public administration by validating diagnostic tests, providing literature, and advising on pharmacovigilance.

Further societal impact has been achieved by the public health experts of DII, providing important information from the reference centre to WHO. The potential for a greater impact is visible to the experts, with projects coming up soon that will hopefully have an impact on dietary habits and improve access for patients to high-end medical treatment.

In terms of scientific impact, DII has initiated and supported successful scientific careers. DII is recognized as a strong research department for research and innovation in immune-mediated diseases, immune-aging, and neuro-inflammation. Successful peer-reviewed publications and the development of methods, in particular, contributed to this assessment by the experts.

The submission of a patent and the outlook of starting a spin-off show a potential economic impact.

The experts flagged one challenge in terms of DII's impact activities:

- The patient perspective has not been sufficiently included in DIIs activities. Therefore, up to now, the potential for societal impact has been limited.

3. Overall assessment and recommendations

3.1 Overall assessment of the department

According to the experts, DII at LIH has performed impressively over the past four years. The overall strategy of strengthening the translational activities has been implemented and the approach of DII members has seemingly been adapted to this strategy. The experts assessed that DII has made progress on all points raised in the previous evaluation. Good examples are the introduction of a project manager and bioinformatics specialist onsite. DII has many highly motivated and talented employees and its director has succeeded in creating a supportive atmosphere. DII has also introduced a number of new facilities with the potential to improve translational activities as well as internal and external collaborations. Furthermore, DII has provided good training and support for PhD students. The experts acknowledge that the quality and quantity of DII's outcome in terms of scientific publications have been very good for most research groups and that some of DII's researchers have generated strong translational activities. Finally, DII's strong media communication has been very successful in creating public awareness and visibility for DII as well as LIH during the COVID-19 pandemic.

Nevertheless, the experts detected some challenges. DII is missing easy access to supportive structures within LIH for setting up and running translational tracks of the research activities. Furthermore, DII has only a few public health researchers who provide evidence-based services and have important knowledge of the societal needs, and the patient perspective has not been included sufficiently in DII's activities. The experts assessed that DII's international visibility is not yet developed enough, and industry collaboration has mainly been based on the proximity of industry and DII. DII's bioinformatics and biostatistics domain is understaffed and underfunded, and DII's gender awareness and inclusiveness are not yet sufficiently developed. The experts are of the opinion that the decision-making process on budget-relevant decisions is not yet transparent across all levels of DII and LIH. In addition, the director of DII is missing a budget for strategic investments; the needs of DII's PIs for equipment have not always been evaluated quickly enough which has sometimes resulted in frustration. The strong dependency of DII on the LIH block grant and FNR funding, with little funding from other sources is also striking, and a missed opportunity given the high level of some of the PIs that qualify for EU funding programmes for research and innovation. Finally, DII and LIH as CRPs do not use teaching and career development opportunities at universities sufficiently to create a win-win situation, and Post-Docs are rare in many DII research groups.

3.2 Recommendations

Based on the observations stated above and in the previous chapters, the expert team formulates the following recommendations (any aspects which concern LIH as well as DII are also reported in the institute report for LIH):

I Recommendation 1: Improve access to supportive structures

The experts recommend that DII should have access to supportive structures, e.g. a translational manager, within LIH for setting up and running translational tracks of the research activities. This should enable more researchers to become active in bedside-to-bench-to-bedside activities, while protecting valuable time for basic research.

Recommendation 2: Strengthen public health research expertise

Given the DII's focus on immunity and infectious diseases and its role as service provider and surveillance unit in this field, the experts recommend that DII strengthens its public health research expertise in infectious diseases in order to ensure an evidence-based service and essential knowledge of societal needs.

Recommendation 3: Better consider patient perspective

The experts recommend that LIH and DII better consider the patient perspective, e.g. initiate a patient panel for developing and evaluating research projects, in order to ensure that patient interests remain a top consideration.

Recommendation 4: Increase international visibility

The experts recommend that DII participates in international collaborations and applies for international grants to further increase international visibility. DII should also consider broadening its collaboration activities with industry.

Recommendation 5: Develop bioinformatics and biostatistics domains

DII's bioinformatics and biostatistics domains should mirror its growing research activities (that rely on such expertise) in terms of budget and personnel. The experts recommend that an independent bioinformatics research unit be created at DII in close collaboration with LIH's core facility. Such a unit should not only ensure easy access for all DII groups, but also play an active role in the design and implementation of novel computational tools to analyse data from high-throughput technologies.

Recommendation 6: Improve gender awareness and inclusivity

The experts recommend that DII improves gender awareness and inclusivity with the goal of achieving a better gender balance at management level. One option is that DII supports researchers at the management level, regardless of gender, in working part-time.

Recommendation 7: Improve transparency and access to strategic budget

The experts recommend that the decision-making process on budget-relevant decisions (e.g. for groups to leave, groups to arrive, creation of PI levels) should become transparent across all levels of DII and LIH. In addition, the director of DII should get a budget for strategic investments to support the agility of the department. This would allow for faster decisions in closer exchange with the PIs.

Recommendation 8: Encourage teaching and career development at universities

The experts recommend that DII and LIH as CRPs not only allow but also encourage teaching and career development at universities by facilitating tenure track possibilities and dual employment by University of Luxembourg and LIH. Transparent processes following preestablished criteria should be developed and implemented. The potentially improved synergies might become extremely important in developing the biomedical landscape of Luxembourg.

Appendix: Agenda of hearing

Monday, 29 August 2022			
1 15:45 – 16:45 Welcome address by the Ministry of Higher Education and Research (MESR)		MESR	
16:45 – 17:00 Break		DII Evaluation team	
2 17:00 – 18:00 Presentation by the Department of Infection and Immunity (DII)		DII Evaluation team	
Time	#	Function/institution of participants	
17:00 – 18:00	1	Head of the Department	
	2	Principal Investigator	
	3	Principal Investigator	
	4	Principal Investigator	
	5	Principal Investigator	
	6	CEO LIH	
18:00 – 20:00	Discussion of self-assessment report and preparation of interviews		Evaluation team
Tuesday, 30 August 2022			
3 8:00 – 9:30 Questions and discussion on the self-assessment report		DII Evaluation team	
Time	#	Function/institution of participants	
8:30 – 10:00	1	Head of the Department	
	2	Principal Investigator	
	3	Group Leader	
	4	Principal Investigator	
	5	Departmental Project Manager	
10:00 – 10:30 Break			
4 10:00 – 12:15, 13:30 – 15:10 Individual interviews		DII Evaluation team	
Time	#	Function/institution of participants	
10:00 – 10:30	1	Head of the Department	
10:35– 11:05	2	Principal Investigator	

11:10 – 11:40	3	Principal Investigator	
11:45 – 12:15	4	Post-doctoral researcher	
12:10 – 13:30 <i>Lunch Break</i>			
13:30 – 14:00	4	Principal Investigator	
14:05 – 14:35	5	Principal Investigator	
14:40 – 15:10	6	Bioinformatician	
15:10 – 15:30 <i>Break</i>			
5 15:30 – 17:15 Group discussions with clients/business partners (group 1) and PhD students (group 2)			DII Evaluation team
Time	#	Function/institution of participants	
15:30 – 16:15	1	Laboratoires Réunis Luxembourg	
	2	Centre Hospitalier du Luxembourg	
	3	Fast Tracks Diagnostics (Siemens Healthineers)	
16:15 – 16:30 <i>Break</i>			
16:30 – 16:45	1	PhD Student	
	2	PhD Student	
	3	PhD Student	
6 16:45 – 17:30 Visit to laboratories and other infrastructure			Evaluation team DII
Wednesday, 31 August 2022			
6 8:30 – 12:00 Discussion of results and report writing			Evaluation team
7 12:00 – 12:30 Presentation of results			MESR DII Evaluation team