INTERFACE

Report on the evaluation of the Life Science Research Unit (LSRU) at the University of Luxembourg

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

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COMPANY INFORMATION

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1 INTRODUCTION

The Ministry of Higher Education and Research (MESR) of Luxembourg mandated *Interface Policy Studies, Research, Consulting*, Switzerland, to organize and lead a research evaluation of the University of Luxembourg. Simultaneously, the Institutional Evaluation Programme (IEP) of the European University Association carried out an institutional evaluation of the University of Luxembourg. The results of the IEP evaluation are published in a separate report.

The research evaluation was conducted in 2016 and followed two earlier evaluations carried out in 2008 and 2012.

The University of Luxembourg has three Faculties with research units conducting research in different scientific disciplines. In addition, there are three interdisciplinary centres.[1] The evaluation focused on the research performance of the University research units and interdisciplinary centres. This report presents the evaluation of the Life Science Research Unit (LSRU).

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

- Rudi Beyaert, professor, associate department director and leader of the Unit of Molecular Signal Transduction in Inflammation at the VIB Inflammation Research Centre and the University of Ghent, Belgium
- Thomas Decker, professor of immunobiology and leader of the group Host Responses and Innate Immunity to Bacteria at the University of Vienna, Austria
- Yves Muller, professor, leader of the research group Protein Structure and Protein Design at Friedrich-Alexander-Universität Erlangen-Nuremberg (FAU), Germany

The peer review consisted of a self-assessment report written by LSRU and a hearing at the research unit that took place in September 2016. The evaluation assessed the period 2012 to 2015. The hearing, which was organized and moderated by Interface, consisted of a self-presentation by the research unit, a group discussion of the self-assessment report, and several individual and group interviews. These included interviews with representatives of the management team, professors, PhD candidates,[2] and further members of the research staff. Based on the experts' assessments, the report was finalized by Louis Schlapbach (sub-contractor of Interface) and Zilla Roose (Interface). The report has been approved by the experts.

1 The Interdisciplinary Centre for Contemporary and Digital History was established in 2016. It is not part of the evaluation, as the assessed period is 2012 to 2015.

2 The University of Luxembourg calls its PhD students 'PhD candidates'.

The overall results of all unit evaluations are summarized in a synthesis report.[3] The synthesis report includes the findings from the interviews with representatives of the management team at the University of Luxembourg.

The report is divided into two parts: The first part discusses the expert team's observations gathered during the evaluation process. The focus is on the input, the output, and the outcome/impact of the research unit:

- *Input* includes the preconditions for the research conducted, such as strategies, financial and human resources, infrastructure, organization, and quality assurance systems.
- *Output* includes the performance of the research unit, exemplified through research 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 politics.

The second part presents the expert team's recommendations for further development of existing strengths and overcoming observed weaknesses.

The evaluation team would like to thank everyone involved for preparing and implementing the hearing at the LSRU, for making the documentation available, and for participating in interviews.

[3] Rieder, Stefan et al. (2017): Evaluation of the University of Luxembourg, Interface Policy Studies, Research, Consulting, Lucerne.

2 RESULTS OF THE EVALUATION

2.1 OVERALL ASSESSMENT

The University of Luxembourg is a very young university. As such, it is to be expected that several processes of internal communication, decision-making, and attribution of leadership at various levels are not yet defined in detail. This allows for rapid development but with the risk of creating disequilibrium (e.g. in growth). The timing of the evaluation is appropriate for the University as a whole but may be too early for this research unit, which went through a difficult phase around 2010 with a subsequent new start in 2012/13.

In general, the LSRU is performing well. However, there are strong discrepancies between the subunits. The LSRU's strong involvement in the organization and teaching of several biomedical study courses at the University of Luxembourg (including the common Doctoral School) together with the interdisciplinary Luxembourg Centre for Systems Biomedicine (LCSB) provides important services to academic education in Luxembourg.

2.2 INPUT

Specific remarks

The LSRU was founded in 2006 as a teaching and research unit of the Faculty of Science, Technology and Communication (FSTC) dedicated to "fundamental biological questions with relevance to human health and disease". It grew with the development of the University of Luxembourg and contributed to the implementation of biomedicine as a national research priority in Luxembourg. Scientific misconduct around 2010[4] brought the research unit into a difficult situation, with the departure of several professors. Guided by a new head of the unit, the period 2012 to 2015 was a restart with consolidation and development of research and teaching of good quality. In 2015, the research unit had around 60 full-time equivalent members including 20 PhD candidates and was organized in six subunits. In the same year, the LSRU moved into two buildings at Campus Belval that are of high quality functionally but provide almost 50 percent less space.

The LCSB was founded in 2009 as an interdisciplinary research centre of the University parallel to the Faculties. It grew rapidly in size and quality and achieved good international visibility. The LSRU and LCSB share the two Biotech buildings at Campus Belval. They focus on different research areas but share some fields of interest, some infrastructure, and several courses at different levels.

[4] In the period before 2010, several cases of fraud occurred within the research unit or in a lab headed by an LSRU professor abroad.

In addition to the evaluated research performance, this report also addresses organizational issues. This is due to the research unit's problems around 2010 and the subsequent restart. Furthermore, the LSRU members themselves also put strong emphasis on these issues in the hearing.

Research strategy

The implementation of a strategy for the period 2012 to 2015 had to overcome major managerial problems (see above), especially the aforementioned loss of subunit leaders and the absence of two further subunit leaders who had taken over higher management positions and factually abandoned their subunit leading role. The new head of the research unit carefully developed the way 'back to normal' and, supported by her colleagues, succeeded in the opinion of the experts in re-establishing a positive attitude for research and high teaching engagement on the part of her colleagues. Part of this development was focusing the entire unit's research on the umbrella topic: signalling networks in cancer and inflammation.

Human and financial resources, infrastructure, and equipment

The experts consider the current subunit leaders that participated in the interviews to be enthusiastic researchers with a clear agenda and a steady increase in scientific output. However, some team leaders were not present at the hearing, especially leaders of those teams that were performing less well based on the documentation available.

The decision-making processes and time frame by which the University of Luxembourg intends to replace subunit principal investigators who retired or were forced to leave did not become clear during the hearing. The experts agree that extended delays in hiring processes necessarily have a negative effect on the productivity of the research unit.

The budget allocated centrally by the University is seen as sufficient by all principal investigators. In addition, the research unit has 17 postdoc positions. Researchers in these positions have contracts limited to five years unless they are shifted to a permanent contract. It seems to the experts that there is a lack of clarity on future career perspectives for some of the permanent and non-permanent postdocs. In the experts' assessment, a career track leading to the *corps académique* as well as a transparent, clear, and unequivocal job description is highly desired.

On the one hand, the move to Campus Belval has led to closer collaborations with the LCSB, access to LCSB equipment, and the potential for synergies. On the other hand, the clear disadvantage is that the research unit's space in the new buildings is less than two thirds of its former size. There is no space reserved for further development of the research unit. The new building Biotech III with additional space for the LSRU is planned, and in the opinion of the experts this is absolutely needed.

The research unit acquired new equipment through start-up packages of new professors or the yearly RU budget from the Faculty, and raised funding for a spinning disk confocal microscope through the *Fondation Cancer*. Apart from start-up grants of new professors, no funding seems to be available at the University level or from the Luxembourg National Research Fund (FNR) for new large equipment or its renewal. Access

to the electronic library has been improved. However, the researchers still lack access to many journals. Sometimes, access is organized by colleagues at other research institutions. Further, during the evaluation period, the research unit had only a small own mouse facility. The experts consider work on mice as standard in experimental tumour biology; the improved access to the existing facility in Belval (the LCSB and the Luxembourg Institute of Health (LIH) have a small facility; a larger one will be available for UL researchers in 2017) has increased the attractiveness of the research unit for future potential faculty members.

Organization

The LSRU is divided into six subunits, coordinated by an LSRU head, who is also principal investigator of one of the subunits. LSRU members appreciate their academic freedom and consider any loss of it as a potential risk to the research unit. The experts rate the academic freedom of LSRU as very high.

Each subunit consists of typically 7 to 10 full-time equivalents and is most often headed by a professor. The number of academic staff members at the LSRU decreased severely due to the departure of scientists, an early retirement, and the fact that two unit members execute their higher management positions full-time. These absences result in a lack of guidance in three out of six subunits that was also obvious to the experts when they spoke directly with research scientists in these groups. Furthermore, the absences cause a heavy administrative load and a particularly heavy teaching load for the remaining active unit members. The currently planned hiring of a full professor for tumour biology will only partly compensate for the deficit in principle investigator positions.

The experts agree that it makes sense to give important higher management positions like vice rector or faculty dean to experienced and qualified scientists, typically professors. However, in most cases, after a period of two to five years they will then continue their research and teaching work as head of a research group. This means that for the duration of their managing duties, they would need enough time to secure a continuation of the research activities within their groups. Therefore, the management duties should not exceed two thirds of their work capacity, leaving at least one third for the research group.

The decisional power of the research unit head does not seem to be formalized by any University or Faculty guidelines. Consequently, in the experts' opinion the position of unit head is inadequately defined, leading to different interpretations and handling of the role. The current head of the LSRU is also the head of one of the six subunits. The experts consider her to be a very good scientist who produces interesting research. In the interviews and discussions, she stated that she sees the role of head as coordinating the research unit rather than as having decision-making authority. Accordingly, decisions are now taken by consensus among the principal investigators. In the opinion of the experts, this management style succeeded in leading the group out of the troublesome period and back to well-focused and well-run research and teaching activities. Nevertheless, the experts state that the LSRU would benefit highly from an institutionally backed leadership role of head of the research unit. For instance, it would allow for the reallocation of existing permanent postdoc positions among the subunits or at

least the redefinition of tasks among these persons in individual units. Currently, the lowest performing unit employs one third of all permanent postdoctoral staff. These persons could instead be shifted to other subunits. In the experts' opinion, the current distribution of permanent positions reflects the 'unit's history'; this means that there is no reward system based on output or allocation according to general needs. At the level of the subunits, the experts see a lack of scientific leadership in the subunits where the leaders are engaged in higher management duties within the University. This is also reflected in a lower output of these subunits.

The LSRU has established core scientist positions: head of the light microscopy facility, an expert in bioinformatics, and a biosafety officer. When talking to principal investigators, postdocs, and PhD candidates, it became obvious to the experts that this is considered an excellent move, since for one, these positions provide services from which all the subunits benefit directly, and for another, they are attractive positions.

The LSRU members are of the opinion that the LCSB is granted considerable advantages compared to the LSRU in terms of space, budget, support facilities, public outreach, and teaching load. This creates some friction, although it is confirmed by the LSRU that the director of the LCSB is not opposed to specific collaborations, including use of complementary equipment and seminar type events at the LCSB. The general impression of the experts is that the LSRU members feel like second-class citizens compared with the LCSB members, for example in terms of budget, teaching, support facilities, and public outreach. It seems obvious to the experts that there is inequality regarding the support and opportunities that are available to the LSRU and LCSB. Since the life science research landscape in Luxembourg is rather restricted, the experts stress that it would be extremely detrimental and a waste of resources for the development of the domain if animosities were to develop between the two units. The LSRU members emphasize the importance of and benefit from person-to-person rather than institutional collaboration between themselves and the LCSB. The LSRU profits from access to modern LCSB equipment. The experts identify the not very flexible handling of assignment of space to the two research units as a main problem.

External research collaborations

According to the self-assessment report, most of the subunits have many ongoing external collaborations. The experts assess the collaboration partners as being of good quality, and the collaborations integrate research unit members in the international scientific community. The LSRU members have established a great deal of cooperation within Luxembourg. Importantly, there is an ongoing attempt to build up a tumour network to consolidate the tumour biology focus.

The experts acknowledge the acquisition of a confocal microscope system by the LSRU, supported by the *Fondation Cancer*, as an achievement that provides important community service and strengthens LSRU/LCSB collaboration in particular.

Quality assurance system

The research unit assures its quality by publishing in peer-reviewed journals.

After the detection of scientific misconduct, the University of Luxembourg installed the Ethics Reviews Panel to supervise the implementation of the European Code of Conduct for Research Integrity at the university level. In the opinion of the experts, this is an adequate measure.

The experts recommend distributing a part of the research unit's budget in accordance with the subunit's output. This could be realized based on the figures that a monitoring system would deliver.

2.3 OUTPUT

In general, the LSRU is performing well, but international visibility is still limited. In general, the experts assess the publication output as good but the publication quality as not as outstanding. Taking into consideration the restart of the unit after 2012/13, also the quantity of papers for the whole unit is good, although the number of papers per full-time equivalent is rather low compared with other groups conducting research in the field of life sciences. However, there are large variations between the subunits, and only a few papers are published in higher profile journals. At the hearing, the principle investigators of the research unit expressed the opinion that they are finally in a good position for improved performance. They see the need to improve their international visibility by publishing in high-profile journals.

The research unit has been successful in acquiring competitive funding, but the experts find the income from competitive third party means modest. It amounts to less than EUR 1,000,000 per year from the FNR and hardly any EU project funding. The subunits do not make enough profit from competitive grants of the FNR.[5] Within the evaluation period, research unit members acquired six individual FNR grants but no ATTRACT[6] or PEARL[7] grants. However, they successfully applied for several AFR[8] student grants from the FNR and small university-internal competitive grants. The experts see room for improvement in third party funding, and the research unit members themselves recognize this, too. Valorization – and, associated with it, industrial income, e.g. from collaboration with biotech companies – is almost completely missing in most of the subunits.

5 Roughly three million euros from 2012 to 2015.

6 The ATTRACT programme of the FNR is designed for researchers not yet established in Luxembourg who demonstrate the potential to become leaders in their field of research. The funding scheme offers promising junior researchers the opportunity to set up their own research team within one of the country's research institutions (see <www.fnr.lu>).

7 The PEARL programme is directed at public research institutions in Luxembourg and leading research professionals abroad. The goals of the programme are to recruit internationally leading researchers with outstanding track records and thereby to strengthen the research areas that are of strategic importance to Luxembourg. PEARL projects have a lifespan of five years with a financial contribution of between three to four million euros by the FNR (see <www.fnr.lu>).

8 The AFR funding scheme serves the specific purpose of providing funding for the training of doctoral candidates. Grants are awarded in the form of an employment contract with the host institution rather than in the form of a scholarship (see <www.fnr.lu>).

In the subunits whose principle investigators are involved in higher management duties (see above), the experts rate the current output as below average.

The experts assessed the research output individually for each subunit:

- Systems Biology is in the opinion of the experts presumably the best performing subunit, at least as reflected by the number and quality of research papers and competitive funding (including participation in EU projects). The research outline is very clear and well structured, and the emphasis is on fast integration of -omics data and pathway modelling. The experts find the epigenetics subgroup promising.

- Signal Transduction: This subunit focuses clearly on melanoma. The subunit is run in close project-related coordination between Iris Behrmann and Stephanie Kreis and focuses strongly on miRNAs (regulation, function, role as biomarkers, transmission by exosomes). The experts assess the projects as innovative and well structured with clear hypotheses. The subunit has also produced interesting data on hypoxia and metabolism. In the experts' opinion, the clarity of project ideas has not always reached the same level of excellence. In view of the contribution to the performance in research and teaching but also in view of general affairs of the research unit (e.g. building, space design), the experts state that Stephanie Kreis deserves a promotion to the professor level. When assessing Iris Behrmann's output, it must be recognized that she allocates much of her time to heading the research unit, which she took over after 2012/13.

- Molecular Disease Mechanisms: The experts assess the subunit's topic as having high potential. There is a clear focus on colon cancer and gastric cancer. The principle investigator supports a subgroup structure; the subgroup leader is a major driving force. The subunit invests in assembling a sample collection (Biobank). Relevant collaborations have been established, also within the research unit (e.g. Systems Biology). The subunit head is highly engaged in doctoral education.

- Calcium Signalling and Inflammation: A general assessment was difficult, because the subunit's head was not available during the hearing. Given the number of staff and funding, the overall output is poor in the opinion of the experts. The principle investigator and most of the associates have very little output; some members did not publish anything as first or senior author during the period under evaluation.

- Neuro Inflammation: Also in the case of this subunit, the leader was not present at the hearing. The experts assess that the principle investigator and most of the associates demonstrate very little output; some members did not publish anything as first or senior author during the period under evaluation.

- Cytoskeleton & Cell Plasticity: The experts note that in the wake of the principle investigator abandoning the subunit, the remaining lab members lack a sounding board and proper guidance.

Being aware of the very difficult period around 2010 that is still affecting the LSRU, the experts assess the research unit as being on a good track to consolidate its strengths. Better performance-based budget allocation, more careful assignment of candidates to non-permanent or permanent postdoc or research scientist positions, and consistent handling of posteriorities are tools that the experts recommend. Moreover,

the experts state that establishment of junior groups that make use of the FNR ATTRACT programme could strengthen the innovation potential of LSRU.

2.4 OUTCOME AND IMPACT

Since the issues mentioned above concern three of the six subunits, the lack of leadership and the currently low research output represent a major problem for the research unit and its scientific visibility and national and international competitiveness.

As mentioned above, the experts assess the output in the umbrella topic of signalling networks in cancer and inflammation as good but with room for improvement. The need for publishing in higher profile journals is recognized; it would allow for higher international visibility. The research area of the unit is very important for economy and society, with a clear potential for translating research into socio-economic applications.

The research unit is highly engaged in all aspects of teaching at the University of Luxembourg, at the bachelor's, master's, and PhD level as well as in the Doctoral School. This is an important contribution to the academic education and society of Luxembourg. The LSRU members stress that they appreciate and respect teaching as an essential part of their professional obligations and academic positions. Nevertheless, the members take on more teaching than they are obliged to, which might be because they also take over the teaching obligations of four colleagues that are missing for different reasons. The LSRU members express that not so much the teaching per se but the administrative tasks that come with teaching consume a lot of time that they would wish to devote to research. The experts state that the vacant subunit head positions should be filled and that teaching obligations should be better divided between the LSRU and LCSB.

The PhD candidates that the experts interviewed are very happy with the research environment at Campus Belval and with their supervision. Even in cases where the principle investigator is not present, according to the PhD candidates, supervision is taken care of well enough by current postdocs. The experts are of the opinion that the PhD candidates are well trained. The Doctoral School programme includes – in addition to the discipline-specific topics – lectures in entrepreneurship, patent rights and start-up formation, management, ethics, and integrity. Further, the existence of a specific grant (Pelican Grant) for attending conferences and research stays abroad is seen as an important asset by the experts.

The LSRU has established some collaboration with local stakeholders. An outstanding example of this is the cooperation with the Fondation Cancer, which enabled the LSRU to acquire a fully equipped confocal microscope system.

So far, one start-up has been founded; however, it did not survive.

2.5 STRATEGY FOR THE FUTURE

The research focus on tumour biology emerged as the result of an extensive discussion process and appears to the experts to be very well chosen. Research achievements of the past around the umbrella topic 'signalling networks in cancer and inflammation' support the focus. Future plans regarding recruitment of new faculty members in this area also appear well thought through and plausible to the experts. The tumour biology focus allows for strategic partnerships, such as with the oncology and immunology units at LIH and provides opportunities to work towards a cancer centre by joining with other cancer-related initiatives in Luxembourg. The experts are of the opinion that partnerships of this kind will be necessary to be successful and visible in the field of cancer, in which many renowned cancer institutes and research labs are active. In this context, the experts rate the ongoing recruitment of a new principal investigator in cellular tumour biology a good strategic move.

3 SUMMARY AND RECOMMENDATIONS

3.1 SUMMARY

The experts consider the LSRU to be generally on a good track. The research unit went through major challenges due to scientific misconduct and had to find a way back from this exceptional situation.

The experts are of the opinion that several high profile and highly promising researchers conduct good scientific research. Nevertheless, the quality and quantity of the output varies considerably between the subunits. The experts assess this as being at least partly due to organizational problems related to the absence of several principal investigators. Some of them are engaged at the university level in leading management positions, some were forced to leave, and one went into early retirement. The experts are of the opinion that the long delay in replacing the missing principal investigators is affecting the research output of the unit considerably. Furthermore, the experts see stronger leadership combined with limited academic freedom as a tool for stronger research performance.

The experts are aware of the partly complicated co-existence of the LSRU and LCSB and the LSRU members' feeling of being in a less fortunate position in terms of space, budget, and personnel. In this context, the expert team is of the opinion that the definition of cancer research as the focus of the research unit was an excellent step. It allows the LSRU to distinguish itself from the LCSB and to gain expertise in an essential subject.

The experts see a need for a clear definition of the role of the research unit head as well as a clear division of teaching load between the LCSB and LSRU. Together with the definition of a career development plan and a tenure track system, this would allow the LSRU to further develop.

3.2 RECOMMENDATIONS

Based on the observations stated above, the expert team formulates the following recommendations for the research unit (recommendations 1 to 8), the University (recommendations 8 to 12), and the MESR (recommendation 8).

Recommendation 1: Further develop the focus on cancer biology

The decision to focus on cancer biology in the future is seen by the experts as a good and presumably the best strategic choice. It will allow the LSRU to obtain a unique position clearly distinguished from the LCSB. The experts support the future strategy that includes additional strength by networking and optimal use of synergies with other Luxembourg institutes that have similar research areas (e.g. LIH and, later, a foreseen Interdisciplinary Research Cancer Centre). The position that is now being advertised should not be the only position for the LSRU in the near future, and the University should ensure to provide attractive packages for hiring LSRU members. Research

unit leaders and the University's top management are advised to elaborate development plans unifying the need for continuity and innovation and allocating positions accordingly.

Recommendation 2: Strengthen interaction with the LCSB

The experts do not see convincing reasons to recommend a merger with the LCSB. Nevertheless, ways to interact and complementarities should be elaborated and promoted. To improve awareness and interactions, the experts identify possibilities in further promotion of joint organization and attendance at weekly LSRU/LCSB seminars with internal and international lecturers. The LCSB should benefit from the area of expertise of the LSRU in molecular signal transduction. The two units could increase their mutual benefits in terms of infrastructure and knowledge. Once the LSRU becomes stronger through collaboration with the LIH, it will become an influential partner and a competitor on more equal terms.

Recommendation 3: More evenly distribute the teaching load across the LSRU and LCSB

The teaching load should be more evenly shared by the LSRU and LCSB. Arrangements and agreements like those between the Max Planck Institutes and university faculties can serve as an example. As the LSRU is involved in the process of recruiting new professors for the LCSB, it should not only bestow the honour of being hired as a professor but also at the same time provide a description of the professor's teaching duties.

Recommendation 4: Ensure that subunit leaders in management positions are present in the subunits

When subunit heads in addition have higher management positions, they must be present at the subunit weekly to ensure guidance of the subunit. They must also make sure that a senior postdoc is given clear responsibilities to take the lead when the subunit leader is not available.

Recommendation 5: Install an advisory board

The experts recommend installing an international advisory board that visits the research unit every one to two years to give advice on the unit's research and publication strategy and help identify opportunities for valorization.

Recommendation 6: Review positions and space

After the introduction of the new professor, the profiles, performance, and leadership of the six subunits and the assignment of positions (postdocs) and space need careful analysis and adaptation. Posteriorities demand actions for better use of the resources and to bring in young researchers.

Recommendation 7: Monitor the subunits' performance

The performance of the subunits should be carefully monitored. Closing down poorly performing units should be seriously considered. Reshuffling existing high quality personnel among the groups is an option to support the better performing groups. The output versus input performance should be used for the assignment of positions and space and for discussions at the level of the dean and the rector's office.

Recommendation 8: Develop career development plans and establish a tenure track system

Career development plans for young researchers should be addressed at the research unit level as well as at the University level. It needs to be clearly communicated that the University of Luxembourg does not foresee promotions from the *corps scientifique* to the *corps académique*. The MESR should consider establishing a tenure track system for highly successful junior group leaders, as is currently already available for AT-TRACT fellows.

Recommendation 9: Relocate all subunits to one building

The experts see the need for more space in a new building; the ideal solution would be to place all of the subunits in one building or to have a connection between the Biotech II and Biotech III buildings. Currently, the research unit has no room for growth. The attitude that the research groups own their space has to be changed to a flexible handling of space assignment according to needs, which fluctuate over time.

Recommendation 10: Offer attractive start packages and funding for renewal of expensive equipment

The experts see a need for the University to continue offering attractive start packages for new professors in terms of budget, positions, and space. Together with the FNR, a fund should be created for new and renewal of equipment. Furthermore, the University should improve the access to electronic journals and invest in core facilities (e.g. mouse house, proteomics).

Recommendation 11: Regulate clearly the role of the research unit head

The University should initiate a discussion with the Faculty and the LSRU about clear regulations regarding the level of guidance and authority leadership that the head of the research unit can exert. Here, different models are possible. The University should also support a good solution for the LSRU and LCSB in terms of defining the individual roles and commitments of the two research units in research and teaching (see recommendation 3 above).

Recommendation 12: Ensure coherence between the different life sciences institutes

The general impression is that Luxembourg's life science institutions are lacking in coherence at the scientific as well as organizational and administrative levels. The University should actively foster the development of research foci within and between institutions to allow for critical mass, international competitiveness, and higher visibility.