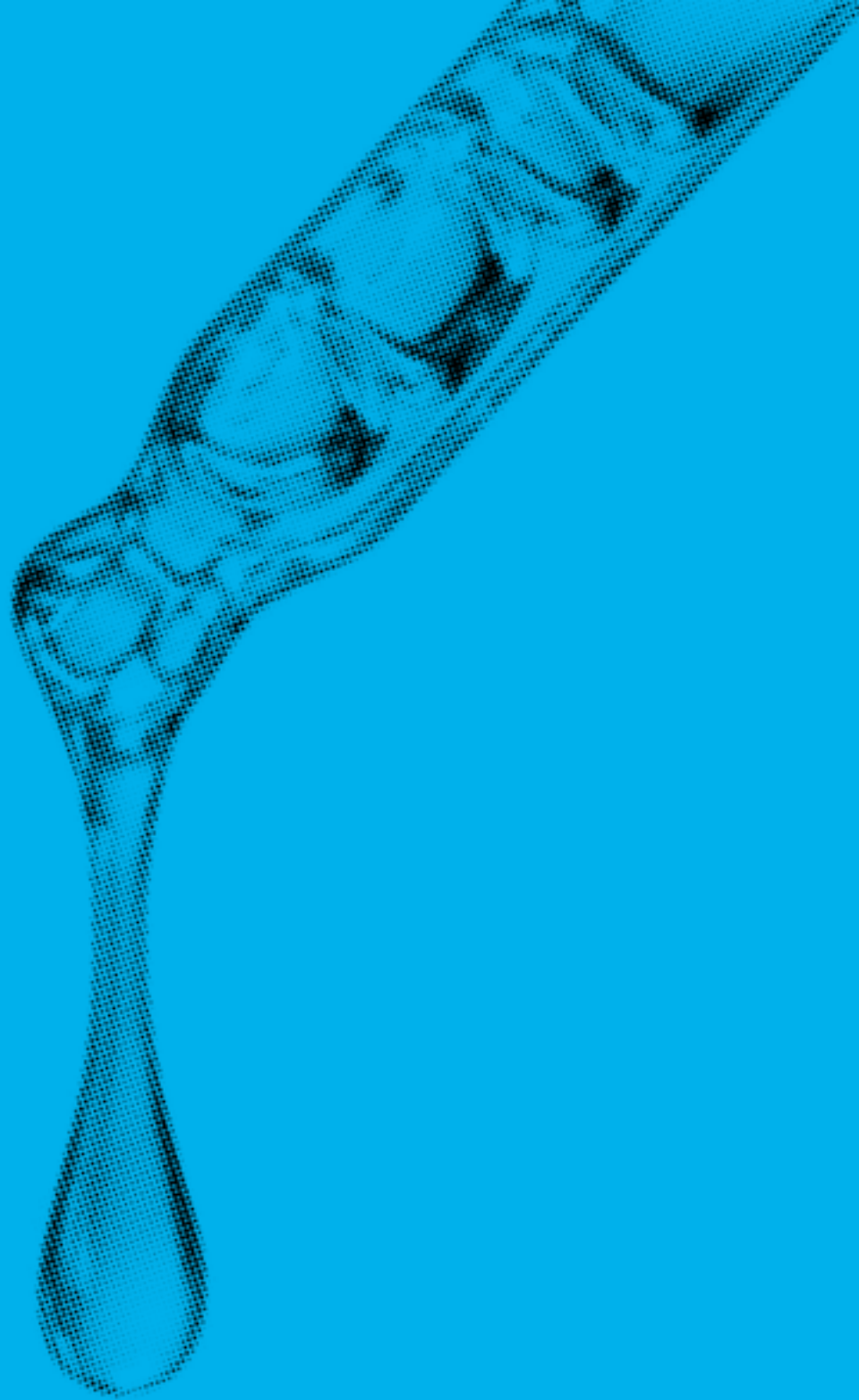


2019

**ANNUAL
REPORT**



ANNUAL REPORT



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FOREWORD

2019 was a “values-based” year for the LNS, in an exceptional way. Where do we stand, where do we want to go – and how do we get there? These were amongst the questions that shaped 2019. We found sustainable answers to these questions – together and at all levels – which allow us to make ourselves fit-for-purpose for the coming years.

How do we turn our good organisation into an excellent organisation? This question has been on our minds for years, and it is particularly important in the health sector, because our profession is driven by permanent innovation. Our laboratory is part of a knowledge-based society and, above all, a pillar of the healthcare system of Luxembourg and the Greater Region. It is therefore our responsibility as professionals and as individuals to provide the best possible services for the country and its people every day.

Such top performance is only possible where a clearly defined vision exists. That vision must be clear for all those involved, and needs to be based on consistently implemented values that are truly lived out. This is why we decided to commit to “Together LNS” in 2019. “Together LNS” is our common value system, the foundation on which we are building the long-term future of our laboratory. The focus is on trust, respect, transparency, cooperation, excellence and professionalism.

All these values apply both internally and externally, involve everyone of our employees, patients, and collaborators and above all, are lived out every day and implemented efficiently and meaningfully at all levels. This can be seen from a number of innovations in our departments, innovations which were continued, completed or initiated in 2019.

Our Forensic Medicine Department, for example, found some answers to the question of which drugs are used in Luxembourg and to what extent, in a Europe-wide project. Our Medical Biology Department expanded mass spectrometer analyses to four major categories of drugs, whereas our microbiologists secured the accreditation of a molecular biology test which allows for rapid in-house identification of most mycoses. Our National Center of Genetics (NCG) insourced Non-Invasive Prenatal Testing (NIPT), a technique that future parents have been familiar with for some years.

While these examples are evidence of a sustainable, people-driven investment in technological excellence, the human factor as such has been further strengthened in other departments. Last year, the National Center of Pathology (NCP) completed the specialization process it had started in 2017 with the aim of making optimal use of existing competencies within the team. As for the Health

Protection Department, its Environmental Hygiene and Human Biological Monitoring Service was reorganized, with Occupational Hygiene added as a new pillar.

Last, but not least, a further milestone was set in the area of hygiene, which is so important for a healthcare laboratory. The Department for Infrastructure & Logistics expanded the in-house cleaning service team with targeted external expertise. This also shows that an organisation like ours can only do justice to its own if there is excellence in all areas and at all levels.

This annual report provides exciting insights into the implementation and the details of these changes. We have formulated our ‘stories’ in English – as somewhat more comprehensive articles – and then translated each of them into a shorter French version. The articles are supplemented by lists of Key Facts and Events for 2019 for each Department, also in English.

With the choice of English as the key language, we are expressing our claim to excellence as an international team working for a highly international country. At the same time, with the use of the French language we aim to respect the cultural background of this country and many of the people we serve. The use of some Luxembourgish elements, both in language and with regards to visual elements and artwork is also deliberately chosen in this context.

Against this background, we would like to thank all partners, especially those in Luxembourg, who accompanied us on our new paths in 2019 and continue to do so in 2020. In times of unforeseen events, that have in the meantime overwhelmed our world and the global healthcare system, and that shape both our professional and our interpersonal lives, strong partners are needed more than ever. Partners who can share excellence in a complementary way, based on mutual respect and trust. To be such a partner is and remains our common goal, now and always.

At this point, I would also like to thank Prof. Dr. Simone Niclou, who served on our board as President from April 2014 until the end of 2019, succeeded by Prof. Dr. Evelin Schröck, who started in her position in December 2019.

Prof. Dr. Friedrich Mühlischlegel

Director





PRÉFACE

Pour le LNS, l'année 2019 a été marquée par un questionnaire fondamental sur nos valeurs. Où nous trouvons-nous ? Dans quelle direction voulons-nous aller ? Par quels moyens allons-nous y parvenir ? Telles sont les questions qui ont façonné 2019. Nous y avons trouvé des réponses durables, tous ensemble et à tous les niveaux, qui nous ont permis d'adapter nos objectifs pour les années à venir.

Comment transformer notre bonne organisation en une excellente organisation ? Cette question nous préoccupe depuis des années, et elle est particulièrement importante dans le secteur de la santé, notre secteur et notre profession étant animés par une innovation permanente, donc par un perpétuel changement. Le LNS s'inscrit dans une société fondée sur la connaissance et constitue, surtout, un pilier du système de santé du Luxembourg et de la Grande Région. Il est donc de notre devoir, en tant que professionnels et individus, de fournir, chaque jour, les meilleurs services de santé possibles pour le pays et sa population.

Ce niveau de performance n'est possible que lorsqu'une vision clairement définie existe. Cette vision doit être claire pour toutes les parties concernées et doit être basée sur des valeurs mises en œuvre de manière cohérente et réellement vécues. C'est pourquoi nous avons décidé de nous engager dans « Together LNS » en 2019. « Together LNS » est notre système de valeurs commun, la base sur laquelle nous construisons l'avenir à long terme de notre laboratoire. L'accent est mis sur la confiance, le respect, la transparence, la coopération, l'excellence et le professionnalisme.

Toutes ces valeurs s'appliquent à la fois en interne et en externe, et surtout, elles sont vécues au quotidien et mises en œuvre de manière efficace et significative à tous les niveaux. Cela se traduit par un certain nombre d'innovations au LNS, innovations qui ont été soit initiées, soit poursuivies ou achevées en 2019.

Ainsi, notre département de médecine légale a apporté, dans le cadre d'un projet européen, des réponses quant aux drogues consommées au Luxembourg et à leur importance. Notre département de biologie médicale a étendu les analyses par spectromètre de masse à quatre grandes catégories de médicaments, tandis que nos microbiologistes ont obtenu l'accréditation d'un test de biologie moléculaire qui permet d'identifier rapidement, en interne, de nombreux pathogènes fongiques. Notre National Center of Genetics (NCG) a mis en place un test prénatal non invasif (NIPT), une technique récente indispensable pour les futurs parents luxembourgeois.

Si ces exemples témoignent d'un investissement durable, axé sur les individus, dans l'excellence technologique, le facteur humain en tant que tel a été renforcé dans d'autres services. L'année dernière, le National Center of Pathology (NCP) a achevé le processus de spécialisation qu'il

avait entamé en 2017, dans le but d'utiliser, de manière optimale, l'expertise existante au sein de l'équipe. Quant au département des laboratoires de protection de la santé, son service de surveillance biologique et hygiène du milieu a été réorganisé, avec l'ajout de l'hygiène du travail comme nouveau pilier.

Enfin, un nouveau jalon a été posé dans le domaine du nettoyage des équipements, tellement crucial pour un laboratoire de soins de santé. Le service infrastructure & logistique a renforcé l'équipe du service de nettoyage interne avec une expertise externe ciblée. Cela montre également qu'une organisation comme la nôtre ne peut rendre un vrai service de qualité à ses patients que si l'excellence est présente dans tous les domaines et à tous les niveaux.

Ce rapport annuel 2019 fournit des informations les plus précises possibles sur la mise en œuvre et les détails de ces changements. Nous avons formulé nos « histoires » en anglais - sous forme d'articles un peu plus complets - et nous avons, ensuite, traduit chacune d'entre elles en une version française condensée. Les articles sont complétés par des listes de faits et d'événements clés pour 2019 pour chaque département, également en anglais.

En choisissant l'anglais comme langue clé, nous exprimons notre exigence d'excellence en tant qu'équipe internationale travaillant pour un pays très international. En même temps, avec l'utilisation de la langue française, nous visons à respecter le contexte culturel de ce pays et des nombreuses personnes que nous servons. L'utilisation de certains éléments luxembourgeois, tant au niveau de la langue que des éléments visuels et des œuvres d'art, est également délibérément choisie dans ce contexte.

Enfin, nous tenons à remercier tous les partenaires, en particulier ceux au Luxembourg, qui nous ont accompagnés sur nos nouveaux chemins en 2019 et qui continueront à le faire en 2020. En ces temps d'événements imprévus, qui ont, entretemps, submergé notre monde et le système de santé mondial, et qui façonnent notre vie professionnelle et interpersonnelle, des partenaires solides et stables sont plus que jamais nécessaires. Des partenaires qui peuvent partager l'excellence de manière complémentaire, sur la base du respect et de la confiance. Être un tel partenaire pour ces derniers est et reste notre souhait, maintenant et toujours.

J'aimerais également remercier le Pr Dr Simone Niclou, qui a présidé notre Conseil d'administration d'avril 2014 à la fin de 2019, à laquelle a succédé le Pr Dr Evelin Schröck, qui a pris ses fonctions en décembre 2019.

Pr Dr Friedrich Mühlischlegel

Directeur





1.0

^ **PROF. DR. FRIEDRICH MÜHLSCHLEGEL**
DIRECTOR LNS

MANAGEMENT

**„TOGETHER LNS“ BEROUT
OP SECHS WÄERTER:
VERTRAUEN, TEAMWORK,
PROFESSIONALISMUS,
RESPEKT, TRANSPARENZ AN
EXZELLENZ. ALL EENZELNE
BEGRËFF HUET SENG
GRONDSÄTZLECH BEDEITUNG
FIR EISE GEMEINSAMEN
ERFOLLEG. EIST ZIIL ASS ET,
ZESUMMEN EPPES ZE
ERSCHAFFEN, OP DAT MIR
ALL HOUFREG KËNNE SINN.**

TOGETHER LNS: TURNING A GOOD ORGANISATION INTO AN EXCELLENT ONE

A system based on values is more than just a declaration of intent. Wherever values are lived, they can make a real difference – and a good organization can become an excellent organisation. This is precisely the goal of the LNS with its “Together LNS” strategy – and 2019 was a key year in this respect.

It goes without saying that such a value system requires a significant time investment. After all, it’s about sustainable change, building something for the long-term. In short: it’s about making something that is already good even better, and hence future proofing it.

A DIALOGUE-ORIENTED TEAM APPROACH

From the very first moment, the name reflected the intent of the program, as LNS Director Prof. Dr. Friedrich Mühlischlegel explains: “Our aim is to create something together that we can all be proud of. That’s why, from the very beginning, we made sure to define our future positioning within an open team approach. The process has always been dialogue-oriented and will remain so. Of course, the focus is always on the result, because this is the only way we can create a value system that works in practice, as each individual can contribute to it.

“Together LNS” builds on the six pillars of Trust, Teamwork, Professionalism, Respect, Transparency and Excellence chosen by the LNS staff. There is no hierarchy between the individual values: “Each value has its fundamental importance for our joint success. One depends on the other, and together they form a coherent framework for us” says the director, who emphasizes in this context that sustainable change always begins inside an organization.



TRUST



TEAMWORK



PROFESSIONALISM



RESPECT



TRANSPARENCY



EXCELLENCE

EVERY SINGLE TEAM MEMBER COUNTS

Values have a significant impact on the daily functioning of a team: “We deliberately want transparency to be understood as a key principle, and, in my view, trust is fundamental to developing a professional structure with a long-term claim to excellence” says Friedrich Mühlischlegel. The same applies to the value of respect: “Without mutual respect, people can’t really make a difference together. This is especially true for teams of a certain size, as in the case of the LNS.”

More than 300 employees work for the LNS. These are experts at all levels who, together, ensure that this national organization can provide excellent services for the country and its people: “Of course one of our focuses is health. But it is not only the individuals who work directly in the laboratory who enable us to perform a leading role in the Greater Region. Our cleaners, guards, our hygiene team, our financial and HR experts equally contribute to this. Each individual shares his or her expertise. That is the philosophy of the ‘Together LNS’ strategy,” says Friedrich Mühlischlegel.

COMMON GOAL: “EXCELLENCE IN HEALTHCARE”

The vision of “Together LNS” is that this philosophy should lead to even more “Excellence in Healthcare”. In order to make this vision binding and thus quickly make it become reality, a strategic plan has been developed. Friedrich Mühlischlegel: “We have defined very specific measures for each element of the strategic plan, all of which we want to implement by 2022. These range from procedures and processes, IT security and stakeholder relations to research projects linked to our core competencies as a laboratory.”

This spectrum also shows that every individual counts, which is why the organisation decided to adopt the participatory approach described above, and took the necessary time to define and communicate the corresponding plan: “We took the first steps on the road to ‘Together LNS’ in 2018 at management and head of department level, but we wanted to make sure that we got all employees on board. That’s why 2019 became the actual year of the sustainable strategic repositioning of LNS,” explains Friedrich Mühlischlegel.

FIRST “PROOF OF CONCEPT”: COVID-19

The spirit associated with this repositioning has already paid off at the beginning of 2020, and in a completely unforeseen and practical way: “With COVID-19, we as LNS were put to the test in several ways. As a leading player of the national healthcare sector, we have been a key part of the response from the very outset. Additionally, we had to switch to and perform in crisis mode very quickly. Successfully managing all this was also a first proof of concept for our lived value system. In general, this shows that values and a strategy can turn professional structures into excellent organizations.”

« TOGETHER LNS » : TRANSFORMER UNE BONNE ORGANISATION EN UNE EXCELLENTE ORGANISATION

Lorsqu'elles sont réellement vécues et appliquées, les valeurs d'une organisation peuvent vraiment faire la différence, et ainsi transformer une bonne organisation en une excellente organisation. C'est l'objectif du LNS avec sa stratégie « Together LNS », et 2019 a été une année clé à cet égard.

Il va sans dire qu'un tel système de valeurs nécessite un investissement important en temps et en énergie humaine. Il s'agit de construire un fondement sur le long terme. En bref, il s'agit d'améliorer davantage ce qui est déjà bien, et donc de le rendre encore plus solide pour l'avenir.

UNE APPROCHE D'ÉQUIPE AXÉE SUR LE DIALOGUE

Pr Dr Friedrich Mühlischlegel, directeur du LNS, explique : « Notre objectif est de créer ensemble quelque chose dont nous pouvons tous être fiers. C'est pourquoi nous avons veillé à définir notre positionnement futur dans le cadre d'une approche ouverte d'équipe. Le processus a toujours été axé sur le dialogue ».

« Together LNS » s'appuie sur six piliers – la confiance, le travail d'équipe, le professionnalisme, le respect, la transparence et l'excellence – valeurs choisies par le personnel du LNS. « Chaque valeur a son importance pour notre succès commun. L'une dépend de l'autre et, ensemble, elles forment un cadre cohérent pour nous », explique le directeur.

CHAQUE MEMBRE DE L'ÉQUIPE COMPTE

Les valeurs ont un impact significatif sur le travail d'équipe au quotidien : « Nous voulons vraiment que la transparence soit comprise comme un principe clé. Quant à la confiance, elle est fondamentale pour développer une structure professionnelle qui revendique l'excellence à long terme », déclare Friedrich Mühlischlegel. Il en va de même pour la valeur du respect : « Sans respect mutuel, les gens ne peuvent pas faire la différence ensemble. »

Plus de 300 employés travaillent pour le LNS. Ce sont des experts à tous les niveaux qui, ensemble, font en sorte que cette organisation puisse fournir d'excellents services au pays et à ses résidents : « Ce ne sont pas seulement les personnes qui travaillent directement dans le laboratoire qui nous permettent de jouer notre rôle. Notre équipe d'hygiène, nos experts financiers et RH y contribuent également. Chaque personne partage son expertise. »

UN OBJECTIF COMMUN : « L'EXCELLENCE DANS LES SOINS DE SANTÉ »

Pour que « Together LNS » devienne rapidement une réalité, un plan stratégique a été élaboré. Friedrich Mühlischlegel : « Nous avons défini des mesures précises pour chaque élément du plan stratégique, que nous voulons mettre en œuvre d'ici 2022. Ces mesures vont des processus relatifs à la sécurité informatique aux relations avec nos partenaires jusqu'aux projets de recherche, liés à nos compétences en tant que laboratoire ».

Ce spectre montre également que chaque individu compte, c'est pourquoi l'organisation a décidé d'adopter l'approche participative, et a pris le temps nécessaire pour définir et communiquer le plan correspondant : « Nous avons fait les premiers pas sur la voie de « Together LNS » en 2018, au niveau de la direction et des chefs de département, mais nous désirions également impliquer tous les employés. C'est pourquoi 2019 a été l'année du repositionnement stratégique durable du LNS », explique Friedrich Mühlischlegel.

QUALITY, SAFETY/ENVIRONMENT AND HYGIENE, METROLOGY (QHSEM)

At the beginning of 2019, the QHSEM team was consolidated with the arrival of Dr sc. Christine Stemmer, LNS Quality Manager and Head of the QHSEM unit.

QUALITY

- A quality governance policy was developed with the creation of a quality unit and a steering committee.
- Support for laboratories was set up on the following topics: transition to the 2017 version of the ISO 17025 standard, training in internal auditing, carrying out internal audits, work on method validation, preparation of external audits.
- In order to take the system into the digital age, the LNS acquired a content management tool that will enable wide-ranging digitization of the documents and traceability pertaining to processes that are crucial for reliable results and stakeholders satisfaction.

METROLOGY

- Insourcing of pipette metrology was finalized, giving greater control and flexibility in metrological pipette monitoring.
- Thermocyclers were added to the metrological process, meaning that most quantities are now handled either internally or through accredited suppliers.
- As part of the central quality assurance system, a more global reorganization process was undertaken, in order to strengthen the skills and organization of metrology staff.

SECURITY

- Security Contact Point team organization was reviewed in order to improve follow-up and efficiency.
- Collaboration between the designated worker and the safety representatives was strengthened.
- Periodic half-day awareness-raising training courses, including workstation analyses, were run.

We were once again awarded the SDK label.

KEY FACT

REPORTING

2019-2022 strategic plan:

- The second strategic plan was ready for launch in January 2019. This was done by means of a white paper describing the basic structure and content of the plan over a four-year period ending in 2022.
- The new strategic plan is built around a shared vision for the LNS, which was jointly developed by its departments. Associated to the LNS vision are overarching strategies that dynamically extend to operational objectives.
- During the first half of 2019, a much more detailed implementation model for the plan was created in a collaborative effort.
- For each department, clear operational objectives were defined, and followed throughout the second semester.
- The strategic plan today includes a total of 106 operational objectives. It is a genuine and authentic effort to set common goals, which bring the vision and values of the LNS together.

COMMUNICATION

CHANGE MANAGEMENT PROJECT "TOGETHER LNS"

- Definition of the LNS vision and values with the involvement of staff members
- Internal communication of "Together LNS"

CORPORATE SOCIAL RESPONSIBILITY @LNS

- LNS pastry amateur weeks, which allowed us to raise funds for the Foundation Cancer and the Fondatioun Kriibskrank Kanner
- Organization of participation of LNS teams in solidarity events like *Relais pour la Vie* by Fondation Cancer, *Lëzt Go Gold* by Fondatioun Kriibskrank Kanner, *Broschkriibslaaf* by Europa Donna Lëtzebuerg
- Organization of the *Expression of Hope* exhibition (by Sanofi) dedicated to rare diseases in the entrance hall in January and exhibition of the collective artwork *#WIN* for breast cancer screening and prevention awareness by Luxembourg artist Jacques Schneider during summer

INTERNAL COMMUNICATION

- Organization, in collaboration with HR, of 2 *Welcome Days* to present the LNS to the new recruits
- Regular updates of the internal news channel with articles and other interesting topics for the staff
- Supervision of the series *20' from administration* presenting administrative topics at regular intervals to the LNS staff
- Production of 8 videos presenting the different aspects of LNS through the eyes of LNS staff members

FURTHER DEVELOP AND IMPLEMENT SOCIAL MEDIA STRATEGY

ONGOING PRESS RELATIONS

ORGANIZATION OF DIFFERENT INHOUSE EVENTS

GUIDED TOURS FOR GROUPS

COORDINATION OF LNS PARTICIPATION IN THE NATIONAL OPEN DAY EVENT MID-SEPTEMBER: GREAT SUCCESS, WITH SOME 600 VISITORS.

KEY FACT

LEGAL AFFAIRS

Collaboration/Cooperation agreements/
documents:

- CHARM agreement (Cholesterol in HAiR Measurement) – CHL/LNS/LIH/Charité Berlin/ UZ Brussel/AMC Amsterdam
- LNS/Ministère de la Protection des Consommateurs Agreement
- CORE Agreement for the CampyloOmic project– FNR/LNS/LIST/UL
- Letter of Intent – Sample-carrying drones project
- LNS/Prostata Karzinom Zentrum HRS MoU
- Mirabank Consortium Agreement (European Center for Disease Prevention and Control – Temporary strain collection for multi-drug-resistant bacteria) – LNS/IBBL
- MTA ECDC Pilot study on WGS – LNS/OSR Italy/ RCB Germany/PHE England
- Agreement – LNS/WIS (*Wehrwissenschaftliches Institut für Schutztechnologien-ABC-Schutz*), Münster

DATA PROTECTION OFFICER

- Data protection impact assessments for the Da Vinci, Telepathology, ABR, e-doctor and Luxith projects. These projects posed high risks to data subjects. An action plan was drawn up in order to minimize such risks.
- Privacy and computer security training. The objective of this training is to reduce the risk of data breaches. Each head of department and service, as well as all the HR staff were trained in 2019 so that they now have basic knowledge on data protection.
- Drafting of policies for video surveillance and physical access management in compliance with the obligations imposed by the GDPR. These policies were then approved by the head of the department concerned.
- Study on the legal basis of data processing activities for research purposes at the LNS. A meeting with the CNER and the University of Luxembourg was held to align this with the discussion on the legal basis for public research (instead of consent).
- Review of all contracts relating to the processing of personal data (MISA, eSanté, Labos réunis, BIOSILICIUM, Illumina, Odoo, Siemens, Francis Crick Institute Limited). Compliance of those contracts with article 28 of the GDPR was checked.
- Business continuity planning with all stakeholders, allowing the LNS to provide its services to the population at any time, even during a crisis.

9 data protection impact assessments started in 2019

10+ computer intrusions avoided



LNS HIGHLIGHTS IN 2019





JANUARY

- **Management:** The LNS's second strategic plan was launched. This was done by means of a white paper describing the basic structure and content of the plan over a four-year period ending in 2022.
- **Health Protection:** Kick-off of the Department's major reorganization, allowing a clear focus on expectations and the new driving scenarios as put forward by its major stakeholders.
- **Administration, Finance and Support Services:** Development of a strategy for the insourcing of sample transport with professionally equipped vans, an up-to-date temperature monitoring system and well-trained LNS drivers. Implementation will take place in 2020.

FEBRUARY

- **Administration, Finance and Support Services / NCP:** Customization of a special workspace for the high-end electron microscope for the National Center of Pathology.
- **Together LNS:** Participation in *Rare Disease Day*

MARCH

- **Together LNS:** Participation in *Lots Of Socks – World Down Syndrome Day*
- **Together LNS:** Participation in *Relais pour la Vie*

MAY

- **Administration, Finance and Support Services / NCP:** Inauguration of the electron microscope with the ROGER DE SPOELBERCH Foundation

JULY

- **NCP:** *Espoir en tête* – 30.000 EUR donation received for project "Molecular Signature of Memory Deterioration", a collaboration between Dr. David S. Bouvier, Dr. Alexander Skupin (LCSB, University of Luxembourg) and Prof. Dr. Michel Mittelbronn (LNS).
- **Health Protection:** End of the Department's major reorganization process.
- **Forensic Medicine:** First anniversary of umedo, the unit for medicolegal documentation of injuries.
- **Together LNS:** Summer barbeque with the entire team.

AUGUST

- **Health Protection:** Dr sc. Radu Duca started as head of the Environmental Hygiene and Human Biological Monitoring Service. Dr sc. Duca brought in strong technical laboratory expertise in the fields of human biological monitoring (HBM) and occupational hygiene.
- **NCG:** In-house Non Invasive Prenatal Testing (NIPT) for aneuploidy screening. Since the 1st of August 2019, the unit has been carrying out about 150 tests per week, making NIPT available to the entire population of Luxembourg.
- **Administration, Finance and Support Services:** Implementation of an energy monitoring system with ± 300 smart meters for electricity, heat production and distribution, and cooling water production and distribution. The purpose of this energy monitoring system is to detect and reduce energy wastage and consequently reduce energy consumption.

SEPTEMBER

- **Microbiology:** Participation as speaker at the "ECBU sampling: practical modalities and recommendations" congress.
- **NCP:** Official ethical approval for brain bank obtained.
- **Medical Biology:** On the occasion of the 11th ISNS (International Society for Neonatal Screening) European regional meeting, the decision was taken that the 2021 edition would be hosted by LNS.
- **Together LNS:** The LNS opened its doors to the general public as part of the 14th edition of the *Dat ka Lëtzebuerg* Open Days.
- **Together LNS:** Participation in *LëtZ Go Gold*.

OCTOBER

- **Microbiology:** Dr. Tamir Abdelrahman started as head of department
- **Microbiology:** Speaker participation in multidisciplinary symposium on antimicrobial resistance.
- **Forensic Medicine:** Prof. Dr. Silke Grabherr (Forensic Medicine, Lausanne/Geneva), member of the *LNS conseil scientifique*, visited the LNS for the assessment of the forensic department.
- **NCP:** Participation in *Broschkriibsdag* at CHdN.
- **NCG:** Nelson Dionisio and Jean Houben joined the team as technicians. With this setup, the unit will further expand its diagnostic activity and portfolio, with the goal to cover the complete diagnostic of haematological malignancies for Luxembourg and build up translational research activities.
- **Together LNS:** Participation in *Broschkriibslaf*.

NOVEMBER

- **Forensic Medicine:** An important step for medicines testing was achieved when the unit successfully passed a medicines testing audit (ISO/IEC 17025 requirements). We are now again certified by the European Directorate for the Quality of Medicines (EDQM) for HPLC/UV, dissolution testing/UV, and residual water determination.
- **Forensic Medicine:** Five years of Forensic Medicine at the LNS.
- **NCG:** With the start of Dr. Guillaume Jouret, we acquired an excellent medical doctor specialized in clinical genetics to reinforce our team of doctors and genetic counsellors.
- **NCG:** Dr. Seval Türkmen started as head of the Haemato-Oncogenetics Unit. Dr. Türkmen is a medical doctor specialised in genetics with long-term experience in the field. Before joining the LNS family, she was the head of the Department of Cancer Cytogenetics at the Charité hospital in Berlin.
- **Health Protection:** The Service presented its research activities and outcomes at the conference "Research in Food Safety", organized by the MCP and EFSA (European Food Safety Authority).
- **Together LNS:** Participation in the *Solidarity March* during the Orange Week.

DECEMBER

- **Medical Biology:** A third biologist joined our ranks. Clément Kebbabi is a clinical biologist; he studied in Nancy and worked in the private sector in France for a few years before joining the LNS. He is particularly competent in IT and quality management and has already been very helpful to the Department.
- **Health Protection:** the Environmental Hygiene and Human Biological Monitoring Service started carrying out human biological monitoring (HBM) analyses on the workers cleaning up the former industrial site at *Pulvermühle*.
- **Together LNS:** LNS supports Médecins du Monde Luxembourg with their digital greeting card.
- **Together LNS:** Distribution of the *Solidarity Boxemännchen*, to support fair trade and the *SOS Kannerduerf Mersch*.
- **Together LNS:** Participation in the "Reverse Advent Calendar" charity event for the benefit of the homeless.

LNS HIGHLIGHTS IN 2019



2.1

^ **DR SC. RADU DUCA**
HEAD OF UNIT

**HEALTH
PROTECTION**

**AN ZESUMMENARBECHT
MAM LUXEMBOURG
INSTITUTE OF HEALTH
AN DEM LUXEMBOURG
INSTITUTE OF SCIENCE
AND TECHNOLOGY
A GEMEINSAM MAM
MINISTÈRE DE LA SANTÉ
SUERGT DE LNS DOFIR,
DASS LËTZEBUERG
UM EUROPÄESCHEN NIVEAU
UN DER SPËTZT STEET.**

HEALTH PROTECTION IN A CHANGING WORLD: LNS ADAPTS THE UNIT OF ENVIRONMENTAL HYGIENE AND HUMAN BIOLOGICAL MONITORING TO THE NEEDS OF ITS STAKEHOLDERS

The LNS is a laboratory for the country and its people. Excellence is made a practical reality here, and thus has a direct impact on real life. With this in mind, the Health Protection Department was reorganized in 2019 – and has become now a fully customer-oriented driven structure.

The LNS sees itself as a service provider, and as such it is geared towards market demand. This market consists primarily of Luxembourg and the Greater Region, and, correspondingly, requirements and challenges are substantial. It is not without reason that the national healthcare system is considered to be of particularly high quality in international comparisons, also because it has succeeded time and again in bundling international excellence and continuously developing its range of services on offer. One of the most recent examples in this context is the reorganization of the Department Health Protection of the LNS in 2019.

EXCELLENCE IN SERVICING AND IN RESEARCH

One of the main projects in the reorganization of the Department Health Protection concerned the Unit Environmental Hygiene and Human Biological Monitoring. Recognised excellence was brought in – or brought back from outside in the person of Dr sc. Radu Corneliu Duca. Radu Duca is an expert in the monitoring of hazardous substances in the air, such as solvents, fine dust, polycyclic-aromatic hydrocarbons, and pesticides. In addition, he has an impressive track record as scientist in the surveillance of hazardous substances (like chromium, lead, solvents, polycyclic aromatic hydrocarbons, pesticides) in the urine, blood and hair of humans, a specialization that is also known as human biomonitoring (HBM).

From 2014 till 2019, he worked at the *Katholieke Universiteit Leuven* in Belgium, one of the oldest and most renowned universities in Europe. More specifically, he managed a laboratory of occupational and environmental hygiene and health that offers services to a broad range of stakeholders, including companies, ministries, and private persons, and this in combination with continuous innovation due to research. Prior to that, Dr sc. Duca did a post-doctoral Marie Curie fellowship at the Luxembourg Institute of Health (LIH), after having studied chemistry and toxicology in France and before in Romania.

RESEARCH AND RELEVANCE GO HAND IN HAND

His renewed activity in Luxembourg is therefore a return, and with good reason: “In Luxembourg, research excellence and practical relevance go hand in hand. This is a principle of the national research eco-system, and it applies in particular to the reorganization carried out in the Department Health Protection”, says Radu Duca. The Department Health Protection, according to the PhD-holding chemist and pharmacologist, is evolving in the recent years from a classical state laboratory to a first-class scientific entity that always has the well-being of the country and its citizens as a first priority.

A STRATEGY BUILT ON THREE PILLARS

Of primary importance in the reorganization process were the stakeholders who pass on demand and act as a link between the end user and the LNS. For the Unit Environmental Hygiene and Human Biological Monitoring, the Ministry of Health (MISA) is the major stakeholder. The common goal of the MISA and the LNS is to have a sustainable supply and support structure in place that meets the current and future needs of its customers, i.e. the Luxembourg government and citizens, as well as the companies that are an intrinsic part in the equilibrium of individual and population well-being and economical welfare. To this purpose, a strategic four-year plan has been developed for the Unit, which is based on three pillars: Indoor Pollution, Human Biomonitoring, and Occupational Hygiene.

TOWARDS A FULL UNIT “ENVIRONMENTAL AND OCCUPATIONAL HEALTH”

Indoor Pollution and Human Biomonitoring are two areas of competence that already existed for longer time in the Unit. Both pillars will be expanded further in size and type of activities as well as in the striving for innovation and excellence. The pillar Occupational Hygiene is new and will answer to the emerging needs of a coordinated approach between measures outside and inside the human body. As a result of this change process, the existing structure is developing towards a full “Unit for Environmental and Occupational Health”.

THE FIRST PILLAR: INDOOR POLLUTION

Currently, the Unit is carrying out the analyses of chemical hazardous substances in the indoor environment of private houses, companies and public buildings such as administrations, schools, day-care facilities. The Unit also goes on-site to take the necessary samples. For the private houses, the LNS forms a synergistic tandem with the MISA that receives the medical prescriptions and authorizes the on-site investigations. The LNS will thus only act after the authorization and at the demand of MISA for the private houses. Public buildings and companies can contact the Unit directly if they are experiencing or suspecting problems of indoor pollution. In that case, the Unit will go on-site to listen to the needs and problems of its clients and elaborate solutions together with them.

In addition to the analyses for chemical hazardous substances in the indoor environment (like formaldehydes, volatile organic compounds, pesticides, flame retardants, bisphenols, phthalates and many others), the Unit will develop and host also the microbiological analyses in the indoor environment in the near future. This includes the analyses of moulds that can be at the basis of respiratory symptoms, allergy, asthma and perturbation of the immunological system. To better interpret and treat the health problems due to indoor pollution, the Unit is now also developing biological markers in urine, hair and blood that reflect the concentrations of hazardous substances in the human body itself. Ultimately, it is only when substances enter in the human body that they can cause damage to health and cause health problems. In the near future, the Unit will thus go on-site and take samples of air, dust and surfaces, as well as blood, urine or hair of the individual persons to come to a more efficient prevention and treatment of health problems.

In a further step, the analyses of air, dust, surfaces and of blood, urine and hair, will also be complemented with questionnaires and interviews during each visit. This is because lifestyle habits, underlying medical conditions and other individual characteristics may determine to a great extent the impact of indoor pollution on the health of an individual and, more broadly, the health of the population. “If we want to come to risk management policies that put the individual patient and the health of the population central, we have to take into account also these influencing factors”, explains Dr sc. Duca. This activity will be developed at the level of the Department Health Protection itself and under the direct supervision of Prof. Dr. An Van Nieuwenhuysse who is a medical doctor and epidemiologist.

THE SECOND PILLAR: “HUMAN BIOMONITORING (HBM):

Metal analyses in urine, blood, red blood cells and hair have been a strength of the Unit for more than 15 years. The Unit is now developing also biological markers for organic compounds. Radu Duca: “Organic compounds constitute a category of hazardous substances that is much larger than the metals and for which it is becoming increasingly clear that they have major impact on human health.”

The Unit will not only perform these analyses for hazardous substances in the environment, but will also offer these analyses in occupational settings. In occupational settings, the need for HBM is emerging as tool to evaluate if for example the personal protection equipment is working efficiently. “Take the case of an industry with exposure to solvents”, continues Radu Duca. “As company, you can take all kind of collective and individual prevention measures to limit the exposure to solvents for your workers. However, by determining regularly the concentrations of solvents or their metabolites in the blood or urine of workers, you can prove immediately whether the individual masks, suits and/or respiratory protection material are efficient and prohibit the entrance of solvents in the human body.”

In this context, the Unit is playing a very active role in the European initiative “HBM4EU”, Coordinating and advancing human biomonitoring in Europe to provide evidence for chemical policy making. HBM4EU is a joint effort of 30 countries, the European Environment Agency and the European Commission, co-funded under Horizon 2020. It generates knowledge to enable the safe management of chemicals and protect health in Europe. Radu Duca: “In collaboration with the Luxembourg Institute of Health (LIH) and the Luxembourg Institute of Science and Technology (LIST), the LNS together with the MISA ensure that Luxembourg is at the front edge of the science-policy interface at European level”.

THE THIRD PILLAR: “OCCUPATIONAL HYGIENE”:

In the occupational settings, the Unit will not only offer services of HBM. The Unit will also go on-site and do measurements in the air, dust, or other matrices. “Occupational settings often represent a wide variation of situations and complex interactions of several stressors. A combination of measures outside and inside the human body, and carried out by the same laboratory, offers the advantage to the employer and the employees to have an integral picture. As such, employer, employees and the occupational (health) services in charge can focus on the elements that are really causing the problems. As LNS, we will go this trajectory with them and together elaborate solutions and work towards improvements”, says Dr sc. Duca. “We are looking forward to these challenges. Together with our highly qualified current team members and the new recruits that have already been approved by the LNS Board of Administrators, we have full confidence in the future.”



LA PROTECTION DE LA SANTÉ DANS UN MONDE QUI CHANGE : LE LNS ADAPTE SON SERVICE DE SURVEILLANCE BIOLOGIQUE ET HYGIÈNE DU MILIEU À DE NOUVEAUX BESOINS.

Le LNS est un laboratoire dédié au pays et à la population. L'excellence est devenue une réalité pratique ici, et a donc un impact direct dans la vraie vie. Le LNS se considère comme un fournisseur de services et, en tant que tel, est orienté vers la demande du marché. Ce marché se compose principalement du Luxembourg et de la Grande Région et, en conséquence, les exigences et les défis sont importants. Dans cet état d'esprit, le Département des Laboratoires Protection de la Santé est devenu une structure totalement orientée vers la clientèle en 2019. L'un des principaux projets était la réorganisation du service de surveillance biologique et hygiène du milieu, y inclus l'arrivée du Dr sc. Radu Duca, expert dans le domaine de la surveillance des substances nocives dans l'air, et le biomonitoring humain.

UNE STRATÉGIE CONSTRUITE AUTOUR DE TROIS PILIERS

L'intervenant principal du service de surveillance biologique et hygiène du milieu est le ministère de la Santé (MISA). L'objectif commun du MISA et du LNS est de mettre en place une structure de soutien durable qui réponde aux besoins actuels et futurs de ses clients, à savoir le gouvernement et les citoyens, ainsi que les entreprises. À cette fin, un plan stratégique quadriennal a été élaboré pour le service, qui repose sur trois piliers: la pollution intérieure, le biomonitoring humain et l'hygiène au travail.

VERS UNE UNITÉ TOTALEMENT ORIENTÉE « SANTÉ DE L'ENVIRONNEMENT ET AU TRAVAIL »

La pollution intérieure et le biomonitoring humain sont deux domaines de compétence qui existaient déjà au sein du service. Ces deux piliers seront encore développés aussi bien en terme de taille et de type d'activités, qu'en terme de recherche et innovation. Le pilier « hygiène au travail » est nouveau et répondra aux besoins émergents d'une approche coordonnée entre les mesures faites à l'extérieur et à l'intérieur du corps humain. Donc, la structure existante évolue vers une « Unité de Santé de l'Environnement et au Travail » à part entière.

PREMIER PILIER : « POLLUTION INTÉRIEURE »

Actuellement, le service effectue les analyses des substances chimiques dans l'environnement intérieur chez les particuliers, dans les entreprises et les bâtiments publics tels que les administrations, les écoles, les crèches. Le service se rend également sur place pour prélever les échantillons nécessaires. En ce qui concerne le domicile des particuliers, le LNS forme un tandem synergique avec le MISA qui reçoit les prescriptions médicales et autorise les investigations sur place. Le LNS n'agira donc qu'après autorisation et demande du MISA pour les bâtiments privés. Les bâtiments publics et les entreprises peuvent contacter le service directement, s'ils rencontrent ou soupçonnent des problèmes de pollution intérieure. Dans ce cas, le service se rendra sur place pour écouter leurs besoins ainsi que leurs problèmes et élaborer des solutions avec eux.

En plus des analyses des substances chimiques de l'environnement intérieur (comme les formaldéhydes, les com-

From January to July 2019, the Department underwent a major reorganization, allowing a clear focus on the expectations of its major stakeholders, i.e. the Ministry of Health (MISA) and the Ministry of Consumer Protection (MCP).

At the end of 2019, the Department included:

- the Food Monitoring Unit (Service Surveillance Alimentaire), hosting 11 national reference labs (NRLs) in line with European legislation,
- the Environmental Hygiene and Human Biological Monitoring Unit (Service de Surveillance Biologique et Hygiène du Milieu). This latter Unit underwent a complete transformation in 2019 and is now in charge of:
 - › The national surveillance programs for indoor pollution as coordinated by MISA;
 - › Measuring human biological markers to assess risks coming from the environment and from professional activities (human biological monitoring HBM);
 - › Carrying out measures in workplaces to support companies and services of occupational medicine (occupational hygiene).

The Department also started investing in the development of environmental and occupational toxicology and epidemiology as an added value to the laboratory activities.

15,087

ENVIRONMENTAL HEALTH ANALYSES

9,452

BIOLOGICAL MONITORING ANALYSES

24,539

TOTAL NUMBER OF ANALYSES

ENVIRONMENTAL HYGIENE AND HUMAN BIOLOGICAL MONITORING

- Indoor pollution: at the request of MISA, the Department has developed an ambitious strategic plan to offer a full-chain service for indoor pollution in the future. This activity will support the national surveillance programs of MISA (homes, schools, day-care facilities, public buildings etc.). To this purpose, the Unit is increasing the field sampling, enlarging the scope of chemical analyses, and will host the analyses of moulds in the near future. The Unit is also developing biological markers in urine, hair and blood that reflect the concentrations of hazardous substances in the human body itself, an activity called human biomonitoring (HBM). For each future visit, the patients will also participate in an interview and a questionnaire to allow better interpretation and treatment of the specific health problems due to indoor pollution.
- Occupational health: the Unit started up intensive collaborations with the services of occupational medicine and various companies. The Unit will develop further HBM and occupational hygiene to meet the needs of the stakeholders in Luxembourg
- At European level, the Unit joined the H2020 project "Coordinating and advancing human biomonitoring in Europe to provide evidence for chemical policy making (HBM4EU)" as program manager for Luxembourg. MISA is the program owner for Luxembourg, and the third linked parties are LIH and LIST.
- Also at European level, the Unit participated as expert in the European SHAMISEN-SINGS project (Nuclear Emergency Situations - Improvement of dosimetric, Medical and Health surveillance - Stakeholder INVOLVEMENT in Generating Science). This project was funded by the European Joint Program for the Integration of Radiation Protection Research (CONCERT).

KEY FACT

- In August, Dr sc. Radu Duca started as head of the Unit, bringing in strong laboratory expertise in HBM and occupational hygiene.
- In December, the Unit started the occupational health surveillance of the workers cleaning up *Pulvermühle*, an old industrial site in the center of Luxembourg. At the request of MISA, the Service de Santé au Travail Multisectoriel (STM) and the Labor Inspection, the Unit takes care of the HBM analyses to ensure that the workers can carry out the remediation works in conditions that are safe for their health.

11,529

MICROBIOLOGICAL ANALYSES

164

ANALYSES CONCERNING THE PRESENCE OF GMOS

5,824

ANALYSES CONCERNING THE PRESENCE OF PESTICIDES, CONTAMINANTS OR OTHER ADDITIVES

17,517

TOTAL NUMBER OF ANALYSES

FOOD MONITORING

- In June, the Service successfully passed its first OLAS audit for its fourth cycle and under the new version of ISO 17025. The scope of method analyses now covers 87 methods in the fields of microbiology, molecular biology, as well as GC and HPLC-MS/MS.
- Also in June, the Service, as NRL for plant toxins, participated in its first proficiency test for pyrrolizidine alkaloids, with satisfactory results.
- The scope of accreditation for pesticides has been increased up to a level not far from being compatible with EU requirements for analysis under the coordinated plan and import controls. The recruitment of additional staff and the purchase of new state-of-the-art instruments, as approved by the Board of Administrators, are likely to enable us to be fully compliant with these requirements that are a *sine qua non* condition to bring these analyses back to Luxembourg instead of continuing the outsourcing.
- The Service was appointed as NRL for plant toxins, NRL for food-borne viruses and NRL for nitrogenous compounds and will implement these activities from 2020 onwards.
- The Service started a collaboration on food contact materials with the Institute of Food Safety, Animal Health and Environment ("BIOR") from Latvia.
- The Service presented its research activities and outcomes at the "Research in Food Safety" conference in November, organized by the MCP and EFSA (European Food Safety Authority). The presentation received much attention and positive feedback.
- The Service started a study on the extraction of mycotoxins from cereal-based food and feed using supercritical conditions (via ASE – Accelerated Solvent Extract). The first results are encouraging, as the extraction yields are unprecedented and may help avoid compromises between more and less polar compounds.

TS AND FIGURES



2.2

^ **DR SC. SERGE SCHNEIDER**
HEAD OF SERVICE

**FORENSIC
MEDICINE**

AM KADER VUN DER
MÉDECINE LÉGALE, SINN
D'KONTROLL VUN DE
MEDIKAMENTER AN DER
DROGENANALYTIK EIS
HAAPTBSCHÄFTEGUNGEN.
OP NATIONALEM NIVEAU
SCHAFFE MIR, ZUM BEISPILL,
ZESUMME MAT DER POLICE,
DER JUSTIZ AN DEM
MINISTÈRE DE LA SANTÉ.
DËST HUET EIS ERMÉIGLECHT,
WÄREND DE LESCHTE JOREN,
ENG UNERKANNT KOMPETENZ
AN DEEM DOMÄN ZE
ENTWÉCKELEN.

FIGHTING DRUG ABUSE: TARGETED ANALYSIS OF WASTEWATER SAMPLES PROVIDES VALUABLE INFORMATION

Which drugs are consumed where in Luxembourg and how much? LNS experts find answers to these questions in wastewater - and thus contribute to targeted awareness-raising campaigns.

Luxembourg is not an island, also when it comes to drugs. This makes it all the more important to have reliable information on the consumption within the country, so as to better understand the situation at local level, and take appropriate measures when necessary. The LNS has been at the forefront of this work for some time now. Together with the Luxembourg Institute of Science and Technology (LIST), the long-term project "Drugs in Wastewater" was launched in 2018, consolidating a number of well-known facts and bringing some new ones to light.

COMPLEMENTARY EXPERTISE BUNDLED IN LUXEMBOURG

At the LNS, the Technical Platform for Analytical Toxicology and Pharmaceutical Chemistry, leads the project, and with good reason, as the head of the unit Dr sc. Serge Schneider explains: "As part of forensic medicine, drugs are one of our main concerns. We work together at national level, for example with the police, the justice and the Ministry of Health, and in recent years, we have jointly developed recognised expertise in this field. In the case of the wastewater project, this expertise is meaningfully complemented by the experts in environmental sciences of LIST."

The initiative is therefore also an example of the powerful bundling of competences in Luxembourg, and shows the level of excellence that can be achieved in the national healthcare system. Serge Schneider: "Our expertise in analytical chemistry is undisputed in Luxembourg and beyond. The fact that we as LNS were able to initiate such a project shows that we also work in a research-oriented manner – which enables us to deliver even more benefits to the country and its people."

VERY HIGH LEVELS OF COCAINE USE DETECTED

The data from wastewater investigations are what really make people listen: samples taken in Pétange (where the wastewater from Differdange, Bascharage and Sanem is also treated) revealed above-average cocaine consumption. Throughout Europe, Pétange is among the top 10% of cities in Europe with highest cocaine and cocaine metabolite concentrations in wastewater.

The results from Pétange were made comparable in a cross-border context thanks to their inclusion in the "Score" project (Sewage Analysis CORe group Europe) of the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). Under this project, 73 cities in 20 countries test their wastewater for cocaine, MDMA ("ecstasy"), amphetamines ("speed") and methamphetamines ("crystal meth"). For the latter substances, the results are more encouraging than for cocaine. While Pétange is in the middle of the European ranking for MDMA use, amphetamines and methamphetamines are below the continental average.

RELIABLE RESULTS THANKS TO HIGH-END TECHNOLOGY

These results are also considered reliable because they are determined at the source, so to speak, explains Dr sc. Adèle Bourmaud, in charge of sample analyses: "Drug residues are excreted in urine. That's why wastewater samples are a very effective means of analysing consumption in a given region both quantitatively and with regard to the type of substances."

In order to make results as representative as possible, the wastewater samples are taken at various intervals and on several days, on site in Pétange. This is usually a three-hour operation, whereby the expertise of LIST is brought to bear on site. The samples are then examined at the LNS using state-of-the-art technology. Adèle Bourmaud on the procedure: "We combine chromatography with mass spectrometry. The former enables us to separate and to quantify molecules in a complex mixture."

EXTENSION TO OTHER WASTEWATER TREATMENT PLANTS IN LUXEMBOURG

The results obtained then lead to socially relevant conclusions, with a range of potential applications. Adèle Bourmaud: "With our results, we can provide information for educational campaigns. In addition, we can also determine whether the proportion of drug traces in wastewater poses a danger to the population. It is not the case in Pétange."

In order to make even better use of the skills acquired in the first phase of the project, the next step will be to encompass additional wastewater treatment plants in Luxembourg. Serge Schneider adds: "Drug consumption is a social problem. As LNS, we want our work to contribute to continuous awareness-raising and sustainable solutions. Bundled expertise in Luxembourg and cooperation with the LIST and the EMCDDA as part of the Score project will continue to drive this in the future."



LUTTE CONTRE LA TOXICOMANIE : ANALYSE CIBLÉE D'ÉCHANTILLONS D'EAUX USÉES

Le Luxembourg n'est pas une île, également en ce qui concerne la consommation de drogues illicites. Afin de comprendre l'évolution dans le temps et d'un point de vue géographique des substances illicites, il est important de disposer de moyens techniques sensibles et spécifiques pour étudier ces paramètres.

Le LNS est à la pointe de ce domaine. Le projet « Drugs in Wastewater » a été démarré en 2018, en collaboration avec l'Institut luxembourgeois des sciences et technologies (LIST).

UNE EXPERTISE COMPLÉMENTAIRE REGROUPEE AU LUXEMBOURG

C'est le Plateau technique de toxicologie analytique et de chimie pharmaceutique qui a initié le projet. Le Dr sc. Serge Schneider, responsable du service, explique : « Dans le cadre de la médecine légale, la drogue est une de nos pré-occupations principales. Nous travaillons avec la police, la justice et le ministère de la Santé, ainsi qu'avec les experts en sciences environnementales du LIST ».

Cette initiative est donc aussi un exemple du regroupement des compétences au Luxembourg, et montre le niveau d'excellence qui peut être atteint dans le pays. Serge Schneider : « Le fait que nous ayons pu lancer un tel projet prouve que nous travaillons dans une optique de recherche appliquée au LNS, ce qui nous permettra de proposer à moyen terme encore plus de services au pays et à la population ».

DES NIVEAUX TRÈS ÉLEVÉS DE CONSOMMATION DE COCAÏNE ONT ÉTÉ DÉTECTÉS

Ce sont les données issues des investigations sur les eaux usées qui interpellent réellement le public : les échantillons prélevés à Pétange ont révélé une consommation de cocaïne supérieure à la moyenne européenne. Dans toute l'Europe, Pétange fait partie des 10 % de villes où le niveau de présence de cocaïne, respectivement des produits de dégradation, dans les eaux usées est le plus élevé. Pour les autres substances recherchées, en revanche, Pétange et ses environs se situent dans la moyenne (ecstasy) ou en dessous (amphétamine et méthamphétamine) de la moyenne européenne.

Les résultats ont pu être comparés par rapport aux données récoltées dans le cadre du projet Score (Sewage Analysis CORe group Europe) de l'Observatoire européen des drogues et des toxicomanies (OEDT). Dans le cadre de ce projet, 73 villes de 20 pays testent leurs eaux usées pour y détecter la présence des stupéfiants les plus couramment rencontrés en Europe.

DES RÉSULTATS FIABLES GRÂCE À UNE TECHNOLOGIE DE POINTE

Ces résultats sont considérés comme fiables car ils sont déterminés à la source, pour ainsi dire, explique le Dr sc. Adèle Bourmaud, responsable des analyses d'échantillons : « Les résidus de drogue sont excrétés dans l'urine. C'est pourquoi les échantillons d'eaux usées sont un moyen très efficace pour analyser la consommation, à la fois quantitativement et en fonction du type de substances ».

Afin de rendre les résultats aussi représentatifs que possible, les échantillons d'eaux usées sont prélevés à différents intervalles et sur plusieurs jours. Il s'agit généralement d'une opération de trois heures, au cours de laquelle l'expertise du LIST est mise à profit sur le terrain. Les échantillons sont ensuite analysés au LNS à l'aide d'une technologie de pointe, à savoir la chromatographie liquide couplée à la spectrométrie de masse tandem.

UNE EXTENSION À D'AUTRES STATIONS D'ÉPURATION DES EAUX USÉES AU LUXEMBOURG

Les résultats obtenus permettent de tirer des conclusions pertinentes d'un point de vue social. Adèle Bourmaud : « Grâce à nos résultats, nous pouvons fournir des informations sur l'évolution du marché des drogues ou aider des campagnes de sensibilisation. En outre, nous pouvons également déterminer si la proportion de traces de drogues dans les eaux usées représente un danger pour la population. Ce qui n'est pas le cas à Pétange ».

The entire Forensic Medicine Department celebrated its 5th anniversary in November.

ANALYTICAL TOXICOLOGY AND PHARMACEUTICAL CHEMISTRY

OMCL (Official Medicines Control Laboratory) certification: In November 2019, the Platform successfully passed an audit for Medicines Testing (ISO/IEC 17025 requirements). After two years of interruption – mainly due to the merger of the Analytical Toxicology and Pharmaceutical Chemistry units – the platform is again certified by the European Directorate for the Quality of Medicines (EDQM) for HPLC/UV, dissolution/UV testing and residual water content determination.

Cannabis testing: By mid-2019, the Platform had received more than 1000 samples of cannabis flowers or cannabis resin seized by police in the now flourishing so-called CBD shops. Each sample was analysed using two independent methods: gas chromatography coupled with mass spectrometry (GC/MS) to check for ingredients, and cannabinoid quantitative analysis using high performance chromatography coupled with UV detection (HPLC/UV). Most samples were below the legal limit of 0.3% tetrahydrocannabinol (THC). Out of the >1000 samples, only two were clearly not CBD cannabis but illegal THC products.

Falsified Medicines analysis: About >150 samples of PDE-5 inhibitors (Viagra-type medicines) seized by Luxembourgish customs were analysed for qualitative and quantitative composition. About two thirds were either not pure or had active ingredient concentrations outside the specified limits. The results were presented before an international illegal medicines working group.

16,091

ANALYTICAL TOXICOLOGY ANALYSES

1,259

PHARMACEUTICAL CHEMISTRY ANALYSES

17,350

TOTAL NUMBER OF ANALYSES

1,934

EXPERT REPORTS

9,498

SAMPLES

KEY FACT

FORENSIC TOXICOLOGY

Scientific Involvement in hair testing studies

Development of a marker (PTCA) to detect prior cosmetic hair treatment with oxidative products (bleaching, coloration...) which may affect drug concentrations.

Study on the influence of BMI on hair ethyl glucuronide concentrations

Revision on the consensus from the international Society of Hair Testing (SoHT) about alcohol markers in hair (expert group meeting in Rome with Dr sc. Michel Yegles)

933

SAMPLES FROM AUTOPSIES

503

SAMPLES FOR URINARY ETG ANALYSES

206

BLOOD ALCOHOL ANALYSES

1,444

HAIR SAMPLES

875

SAMPLES FROM LEGAL CASES REQUESTED BY THE POLICE

FORENSIC GENETICS

Achieving excellence: production enhanced, accreditation extended, improved client relations

The Service has been appointed to organise the 2021 annual meeting of the French Speaking Working Group (FSWG) of the International Society for Forensic Genetics (ISFG), which will be held in Luxembourg. The FSWG consists of more than 20 laboratories from Belgium, France, Greece, Luxembourg, Morocco, Switzerland and Quebec (Canada).

FORENSIC MEDICINE

107

AUTOPSIES

71

EXPERT OPINIONS

TS AND FIGURES

A halftone portrait of a woman with dark hair, wearing a dark top, set against a blue background. The portrait is rendered in a grid of dots, with the density of the dots varying to create shading and depth.

2.3

^ **FRANCE DEBAUGNIES**
CLINICAL BIOLOGIST

**MEDICAL
BIOLOGY**

**BEI EIS STEET D'QUALITÉIT VUN
DEN ANALYSEN AN D'UPASSUNG
VUN DE PROZEDUREN UN DÉI
LOKAL FUERDERUNGEN AM
FOKUS. MIR HUNN EIS DOZOU
ENTSCHHEET ENG SPEZIALISÉIERT
AKTIVITÉIT HEI ZU LËTZEBUERG
AN DEM DOMÄIN ZE
ENTWÉCKELEN. ENG MÉI
SCHNELL BEAARBECHTUNG VUN
DEN ANALYSEN A MÉI KUERZ
DELAIEN AN DER ZOUSTELLUNG
VUN DE RESULTATER ERHÉIJEN
SOU D'QUALITÉIT VUN DER
KLINESCHER VERSUERGUNG
VUN EISE PATIENTEN.**

MEDICAL TOXICOLOGY: RANGE OF ANALYSES OFFERED CONTINUES TO EXPAND THANKS TO MASS SPECTROMETRY

It is within the Clinical Toxicology Unit that the Department of Medical Biology underwent its biggest changes in 2019. By expanding mass spectrometer analyses to four major categories of drugs, the unit is meeting an important need of Luxembourg healthcare professionals and provides personalised therapeutic drug monitoring for patients.

The Medical Biology Department of the LNS is made up of four complementary units: Biochemistry and specialized Hormonology, Prenatal Screening, Neonatal Screening and Metabolic Disorders and, finally, Clinical Toxicology.

In the latter unit, 2019 was particularly rich in new developments, as a very large panel of additional analyses was added to the list thanks to mass spectrometry. This analytical technique allows to simultaneously identify and quantify multiple analytes in blood and urine samples, based on their mass-to-charge ratios. It now plays an important role in neonatal screening, metabolic disorder diagnosis or toxicology thanks to its high sensitivity and specificity.

Four major categories of drugs have thus been integrated in the already long list of analyses carried out by the Clinical Toxicology Unit: antidepressants, antipsychotic drugs, anticonvulsant drugs, benzodiazepines and other anxiolytics.

THERAPEUTIC AND PERSONALIZED DRUG MONITORING

Why did the LNS decide to implement this change in 2019? As a response to numerous requests from other laboratories – from within hospitals and private laboratories – as well as hospital clinicians and rehabilitation centres. This expanded service will bring about many benefits for patient care. First of all, they allow therapeutic monitoring of drugs. The results make it possible to personalize drug dosage for each patient. This avoids being above the toxic concentration or below the effective concentration, which is something that can occur when the therapeutic margin is narrow, i.e. when the difference between the effective dose and the toxic dose is small.

The new analyses therefore allow informed recommendations to be made for these particular drugs. Inter-individual pharmacokinetic variability between patients is a fact. From one individual to another, patients differ in their ability to absorb, distribute and metabolize medication. Thus, an elderly patient, a pregnant woman, or a child will react differently to the same compound. These analyses also help to confirm compliance and to detect a suspected drug interaction.

AN OPTIMAL PROCESS CARRIED OUT DIRECTLY IN LUXEMBOURG

To meet this need, the LNS has also put in place a clear and effective, tried and tested process. "We validated the technique for our laboratory according to the recommendations of ISO15189:2012. This allows us to optimize the various analytical parameters to guarantee precise and accurate results.", explains France Debaugnies, clinical biologist from the Medical Biology Department.

This 2019 innovation is an illustration of the LNS's values put into practice: "Excellence, of course, in the quality of the work and results provided, but also genuine adaptation to local needs. It is important for us to improve the dialogue between clinicians and laboratories. In addition, we have chosen to carry out a specialised activity here in Luxembourg and thus avoid sending these analyses abroad. Finally, faster treatment and shorter turnaround times increase the quality of clinical care for patients.", says France Debaugnies.

A PANEL THAT WILL CONTINUE TO EXPAND IN THE FUTURE

While the range of tests the clinical toxicology unit performs is already large, the team does not intend to stop there. It already plans to further expand the list of drugs studied to include antiretroviral drugs, immunosuppressants and anti-arrhythmic drugs. New developments for applied clinical research are also in the works, in collaboration with the other research institutes in Luxembourg.

TOXICOLOGIE CLINIQUE : LE PANEL D'ANALYSES S'ÉLARGIT GRÂCE À LA SPECTROMÉTRIE DE MASSE

C'est au sein de l'unité toxicologie clinique que le département de biologie médicale a connu ses plus grands changements en 2019. En intégrant quatre grandes catégories de médicaments aux analyses réalisées par spectrométrie de masse, l'unité a répondu à un besoin important.

Le département de biologie médicale se compose de quatre unités : la biochimie et l'hormonologie spécialisées, le dépistage prénatal, le dépistage néonatal et les maladies métaboliques et, enfin la toxicologie clinique. Dans cette dernière unité, un très large panel d'analyses a été ajouté au carnet d'analyses grâce à la spectrométrie de masse.

Cette technique d'analyse permet d'identifier et de quantifier des molécules d'intérêt dans le sang et l'urine en fonction de l'intensité de leur rapport masse / charge. Elle a aujourd'hui une place importante dans le cadre du dépistage néonatal, du diagnostic des maladies métaboliques ou de la toxicologie grâce à une grande sensibilité et à sa sélectivité. Ce sont donc quatre catégories principales de médicaments qui ont ainsi intégré la liste déjà longue des analyses effectuées par la toxicologie clinique : les antidépresseurs, les médicaments antipsychotiques, les médicaments anticonvulsivants ainsi que les benzodiazépines et autres anxiolytiques.

UN SUIVI THÉRAPEUTIQUE PERSONNALISÉ DES MÉDICAMENTS

Ces nouveaux dosages sont réalisés dans le cadre du suivi thérapeutique des médicaments. Les résultats donnent, en effet, la possibilité d'ajuster le traitement médicamenteux de chaque patient. On évite ainsi d'être au-dessus de la concentration toxique ou en dessous de la concentration efficace, ce qui peut se produire lorsque la marge thérapeutique est étroite, c'est-à-dire lorsque la différence entre la dose efficace et la dose toxique est faible.

Ces analyses permettent d'ajuster au mieux la posologie des médicaments étudiés. Il peut en effet exister de grandes variabilités pharmacocinétiques entre les patients, qui diffèrent dans leur capacité à absorber, et métaboliser le médicament. Ainsi, un patient âgé, une femme enceinte ou encore des enfants ne réagiront pas de la même façon à une même dose de médicament. Ces dosages permettent également de confirmer l'observance du traitement et de détecter des interactions médicamenteuses.

UN PROCESSUS OPTIMAL EFFECTUÉ DIRECTEMENT AU LUXEMBOURG

Cette nouveauté 2019 est venue illustrer concrètement les valeurs du LNS : « L'excellence, bien sûr, dans la qualité du travail et des résultats fournis, mais aussi une réelle adaptation aux besoins locaux. Le traitement plus rapide des échantillons et des délais d'exécution plus courts augmentent la qualité de la prise en charge clinique des patients », détaille France Debaugnies.

L'équipe a prévu d'élargir encore la liste des médicaments analysés en y incluant les médicaments antirétroviraux, les immunosuppresseurs et les anti-arythmiques. De nouveaux développements pour la recherche clinique appliquée sont également prévus en collaboration avec les autres instituts de recherche au Luxembourg.

27,393

HORMONAL ESSAYS

37,854

NEONATAL & METABOLIC ANALYSES

8,769

PRENATAL SCREENING

32,120

CLINICAL TOXICOLOGY ANALYSES

- A third biologist joined us in December. Clément Kebbabi is a clinical biologist; he studied in Nancy and worked in the French private sector for a few months before joining the LNS. He is particularly competent in IT and Quality Management and has already been very helpful to the Department.
- Thanks to the new mass spectrometer acquired in 2018, we are now able to screen and carry out quantitative analyses for a large panel of drugs: antidepressants, antiepileptics, benzodiazepines and related drugs, neuroleptics and antipsychotics, as well as opioids such as tramadol. We are also able to measure anti-cancer drugs such as methotrexate.
- The Reception Centralisée is now in charge of the switchboard for the entire LNS, and the team took part in insourcing sample transport, by establishing a new temperature monitoring system.

KEY FACTS AND FIGURES



2.4

^ **DR. ALEXANDRE MZABI**
DEPUTY HEAD OF SERVICE

MICROBIOLOGY

**D'UNITÉIT FIR MEDEZINESCH
MYKOLOGIE BESTEET AN
HIRER HEITEGER FORM
ZËNTER DER GRËNNUNG
VUM LNS AM JOER 1980.
MIR SCHAFFE MAT DEN
DERMATOLOGEN AUS DEM
GANZE LAND ZESUMMEN,
SOUWUEL AUS DE PRIVAT
PRAXISSEN WÉI OCH AUS DE
SPIDEELER. DËS EXZELLENT
ZESUMMENAARBECHT
BAUT OP DER STAARKER
KOMPETENZ VUN EISEM
LABO OP.**

THE MEDICAL MYCOLOGY DIVISION: AN ACTIVITY FOCUSED ON DIAGNOSIS AND EXPERTISE

Since its creation, the medical mycology division has been steadily developed, with the accreditation of the “in-house” duplex PCR¹ Dermatophytes-Trichophyton rubrum – a molecular biology test which allows for the rapid identification of most mycoses – by OLAS (Office Luxembourgeois d’Accréditation et de Surveillance) in 2019 as the most recent initiative.

DIAGNOSIS AND EXPERTISE IN MEDICAL MYCOLOGY



The medical mycology division of the LNS is an integral part of the Bacteriology-Mycology-Antimicrobial Resistance and Hospital Hygiene Service, which is one of the three services of the LNS's Department of Microbiology. "The medical mycology division has existed since the creation of the LNS in its current form, i.e. since 1980," explains Dr. Alexandre Mzabi, a physician specialized in bacteriology and medical mycology, and Deputy Head of the Service.

"First and foremost, the focus of our division lies on diagnosis, serving both physicians and patients. The primary objective is to provide diagnostic confirmation in cases of dermatological, respiratory or other infections that are presumed to be fungal. In addition, we provide expertise in medical mycology for various diseases, such as aspergillosis, invasive fungal infections..."

FROM MANUAL TECHNIQUES TO MOLECULAR BIOLOGY



Until 2005, the activity of this division revolved around 800 samples per year with exclusively manual analyses, based on microscopy and microbiological cultures. Alexandre Mzabi: "The time required to get the results was long, in the range of two to three weeks, as they were dependent on the culture. Additionally, from 2006 onwards, the demand for analyses increased steadily."

As a result, techniques have diversified with the arrival of MALDI-TOF² mass spectrometry for yeast identification (2011) and molecular biology for the first mycology PCRs (2012). However, the activity continued to rely on the knowledge, know-how and expertise of several laboratory workers in the division. Today, around 1,300 mycology samples are managed per year, representing some 6,000 analyses.

SOLID EXPERTISE IN DERMATOLOGICAL MYCOLOGY



"The medical mycology division collaborates to a large extent with dermatologists in the entire country, both in towns and in hospitals. This long-term collaboration is built on our laboratory's strong expertise in the field of dermatological fungal infections, and more particularly dermatophyte infections," says Alexandre Mzabi.

In this context, in 2012, an "in-house" duplex PCR was developed, which enables rapid diagnoses of a dermatophyte infection and identification of *Trichophyton rubrum* if necessary: "The development of 18S sequencing, shortly afterwards, completed the range of molecular techniques available in the laboratory. It allows the identification of any filamentous fungus and dermatophyte, and puts the Service at the cutting edge of its field."

¹ Polymerase Chain Reaction

² Matrix Assisted Laser Desorption Ionisation-Time Of Flight

ACCREDITATION: A HIGHLIGHT OF RECENT YEARS

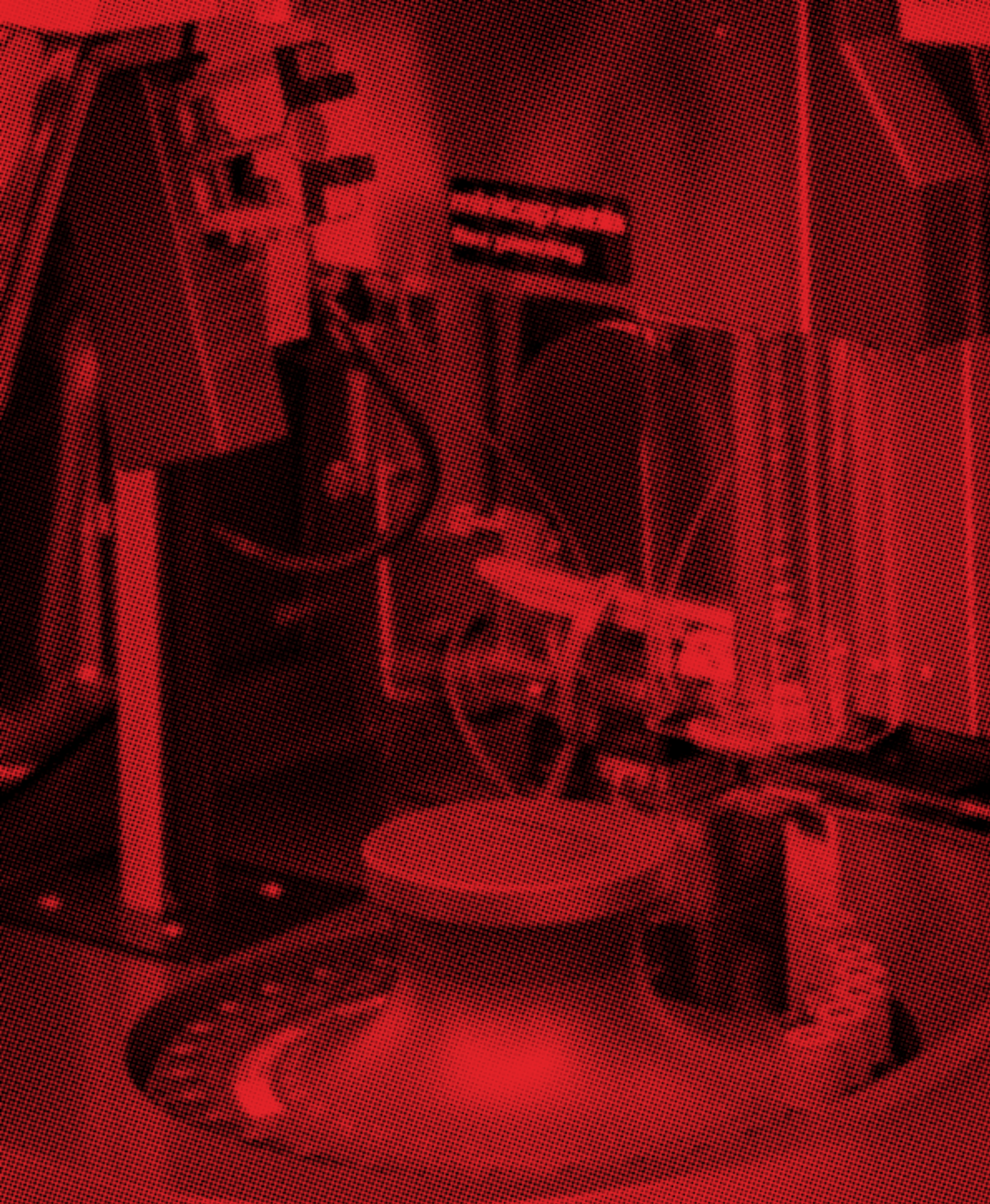
At the end of 2017, the method for yeast culture and yeast identification by MALDI-TOF mass spectrometry was accredited. Then, at the end of 2019, the duplex “in-house” PCR Dermatophytes-Trichophyton rubrum was ISO 15189 accredited by OLAS (Office Luxembourgeois d’Accréditation et de Surveillance). Those two events are among the highlights of the last few years. Dr. Alexandre Mzabi considers these accreditations to be a continuation of the analysis accreditations the Service has known since 2011:

“Although the duplex “in-house” PCR Dermatophytes-Trichophyton rubrum had been used by our laboratory for several years by 2019, we wanted to get this analysis accredited to give added value to our results. The major challenge of this accreditation was that this PCR is an “in-house” PCR, and not a commercially available “ready-to-use” PCR kit. In addition to being accredited, this work was selected to be presented at the European Congress of Clinical Microbiology and Infectious Diseases (ECCMID) 2020 in Paris,” says Dr. Alexandre Mzabi.

VARIOUS AMBITIONS FOR THE COMING YEARS

The aim of the Service is to get all mycological analyses (except sequencing) accredited by the end of 2020. In addition, it wishes to set up new analyses like anti-fungal susceptibility testing and mould identification via MALDI-TOF mass spectrometry. Regarding the latter, the laboratory has worked in collaboration with the team of Pr. Renaud Piarroux in Paris. After several weeks of testing and comparison with 18S sequencing, the new identification method was successfully implemented.

“These new analyses will undoubtedly bring added value to the Service and, at the same time, to the LNS, as they are practical examples of our collective quest for excellence,” says Dr. Monique Perrin, Head of the Bacteriology-Mycology-Antimicrobial Resistance and Hospital Hygiene Service. “At the LNS, we hope to see the medical mycology division designated as Reference Laboratory for Luxembourg, since the country does not currently have a reference laboratory for mycological diagnosis, despite the fact that fungal infections represent an increasingly significant part of infectious diseases.”



LA MYCOLOGIE MÉDICALE : UN SECTEUR CENTRÉ SUR LE DIAGNOSTIC ET L'EXPERTISE

Depuis sa création, le secteur de mycologie médicale n'a cessé de se développer, l'accréditation de la PCR duplex « in house » Dermatophytes-Trichophyton rubrum - un test de biologie moléculaire qui permet l'identification rapide des dermatophytoses - par l'OLAS (Office Luxembourgeois d'Accréditation et de Surveillance) en 2019 étant l'initiative la plus récente.

« Le secteur de mycologie médicale existe depuis la création du LNS dans sa forme actuelle, c'est-à-dire depuis 1980 », explique le Dr Alexandre Mzabi, Responsable Adjoint du Service de Bactériologie-Mycologie-Antibiorésistance et Hygiène Hospitalière. « L'objectif premier de ce secteur est de fournir une confirmation diagnostique dans les cas d'infections dermatologiques, respiratoires, ou autres, qui sont présumées être d'origine fongique. Par ailleurs, nous fournissons une expertise en mycologie médicale pour diverses maladies, telles que l'aspergillose ou les infections fongiques invasives ».

DES TECHNIQUES MANUELLES À LA BIOLOGIE MOLÉCULAIRE

Jusqu'en 2005, l'activité de ce secteur tournait autour de 800 échantillons par an avec des analyses exclusivement manuelles. Le temps nécessaire pour obtenir les résultats était long. À partir de 2006, la demande d'analyses a augmenté. En conséquence, les techniques se sont diversifiées, avec l'arrivée de la spectrométrie de masse MALDI-TOF pour l'identification des levures (2011) et la biologie moléculaire pour les premières PCR mycologiques (2012).

UNE SOLIDE EXPERTISE EN MYCOLOGIE DERMATOLOGIQUE

Environ 1 300 échantillons mycologiques sont gérés chaque année, ce qui représente quelque 6 000 analyses. Le secteur de mycologie médicale collabore avec des dermatologues dans tout le pays. Cette collaboration s'appuie sur la forte expertise du LNS dans le domaine des mycoses dermatologiques, et plus particulièrement des infections à dermatophytes. Dans ce contexte, en 2012, une PCR duplex « in house » a été mise au point. Le développement du séquençage 18S, peu de temps après, a complété la gamme des techniques moléculaires disponibles dans le laboratoire.

L'ACCREDITATION : UN POINT FORT DE CES DERNIÈRES ANNÉES

Fin 2017, la culture et l'identification des levures par spectrométrie de masse MALDI-TOF ont été accréditées. Puis, fin 2019, la PCR duplex « in house » Dermatophytes-Trichophyton rubrum a été accréditée ISO 15189 par l'OLAS (Office Luxembourgeois d'Accréditation et de Surveillance). Dr Alexandre Mzabi : « Le défi de cette accréditation était que cette PCR est une PCR « maison », et non un kit PCR directement disponible sur le marché. En plus d'être accrédité, ce travail a été sélectionné pour être présenté au Congrès Européen de Microbiologie Clinique et des Maladies Infectieuses (ECCMID) 2020 à Paris ».

DES AMBITIONS DIVERSES POUR LES ANNÉES À VENIR

L'objectif du secteur est de faire accréditer toutes les analyses mycologiques (à l'exception du séquençage) d'ici la fin de l'année 2020. En outre, le secteur souhaite mettre en place de nouvelles analyses comme les tests de sensibilité aux antifongiques, et l'identification des moisissures par spectrométrie de masse MALDI-TOF.

« Ces nouvelles analyses apporteront sans aucun doute une valeur ajoutée au service et, par la même occasion, au LNS, car elles représentent des exemples concrets dans notre quête collective d'excellence », déclare le Dr Monique Perrin, Responsable du Service de Bactériologie-Mycologie-Antibiorésistance et Hygiène Hospitalière. « Au LNS, nous espérons voir le secteur de mycologie médicale désigné comme laboratoire de référence pour le Luxembourg. En effet, le pays ne dispose pas actuellement d'un laboratoire de référence pour le diagnostic mycologique, malgré le fait que les infections fongiques représentent une part de plus en plus importante des maladies infectieuses ».

VIROLOGY AND SEROLOGY

Poliovirus surveillance is integrated into the communicable infectious disease surveillance system according to the International Health Regulations (IHR). In 2019, the EV screening (RT-PCR) of 102 persons in high-risk group yielded 15 positive results. Only one case of Polio Sabin 1-3 was detected and confirmed by Robert Koch Institute (RKI). Additional enterovirus surveillance (RT-PCR) was performed to support poliovirus surveillance. 686 enterovirus tests were realized in 2019 yielding 143 positive results. No AFP and no patient with significant clinical signs were declared in 2019.

The participation of Virology Unit in the “European enterovirus surveillance network” is recognized by a publication in the journal *The Lancet Infectious diseases*: “Circulation of non-polio enteroviruses in 24 EU and EEA countries between 2015 and 2017: a retrospective surveillance study”.

The “1 August 2018 Act on mandatory reporting of infectious communicable diseases” came into force on 1 January 2019, is the principal piece of legislation that deals with the prevention and control of infectious diseases. The LNS is one of the first laboratories in Luxembourg to transmit the mandatory declarations of transmissible infectious diseases electronically.

The Virology and Serology Unit is awarded in December 2019 the OLAS Accreditation according to the ISO15189 standard.

30,911

SEROLOGY ANALYSES

16,077

PCR ANALYSES IN VIROLOGY

15

CELL CULTURES

1,829

TOTAL TESTS INCLUDING
1,160 WHOLE GENOME ANALYSES

KEY FACT

EPIDEMIOLOGY AND MICROBIAL GENOMICS

- Active participation in European foodborne pathogen surveillance: The Unit compared 1032 national strains identified using whole genome sequencing with strains from 73 international outbreaks by whole genome analysis.
- Urgent inquiry launched on the European web-based communication platform (EPIS-ECDC) triggered by our surveillance data and regarding two Luxembourgish cases of listeriosis caused by one strain. Potential source not elucidated and no link with other clinical cases in the EU detected.
- Active participation in the investigation of an outbreak of *Salmonella enterica* serotype Poona affecting France, Belgium and Luxembourg (1 case) in infants linked to a manufacturing facility in the EU.
- Sequencing of the seasonal flu for monitoring at EU level: 128 samples reported.
- Start of a new research project entitled EMBRACE on the association of the human vaginal microbiome with HPV infection using metagenomics approach for deep sequencing
- Collaboration with LIST (Esch-sur-Alzette, Luxembourg) in a new project, "CampyTOF" aimed at developing automated detection of antimicrobial resistances by MALDI-TOF spectrometry of *Campylobacter*.
- Collaboration in the identification of the new species of *Campylobacter armoricus* in partnership with LIST (Luxembourg), LMVE (Luxembourg), IFREMER (France), and *Campylobacter* NRL (France).
- 9 publications in peer-reviewed journals, 7 presentations at international conferences.
- A PhD student and post-doctoral researcher joined the team to work on EMBRACE project.

BACTERIOLOGY, MYCOLOGY, ANTIBIOTIC RESISTANCE AND HOSPITAL HYGIENE

Three successful challenges:

- Development of a method for the detection of dermatophytes and identification for *Trichophyton rubrum* by duplex real-time PCR from mycological samples and cultures.
- Expansion of ISO 15189 accredited testing portfolio with two new tests included in the scope.
- Implementation of the mandatory electronic declaration of infectious diseases, after six months of work in close collaboration with the LNS IT unit, e-Santé and the Ministry of Health (Inspection sanitaire).

Participation as a speaker in continuous medical education sessions for medical staff:

- multidisciplinary symposium on antimicrobial resistance
- ECBU sampling: practical modalities and recommendations (as part of the national antibiotics plan)

Supervision of students and technicians in training: four in 2019, including one final 6-month master's internship.

37 731

TESTS IN 2019,

representing an increase of 9.4% compared to 2018. Increase in activity is attributed to increased demand for real-time PCR (pulmonary PCR, PCR for sexually transmitted infections, PCR for mycobacteria etc)



2.5

^ **DR. OLFA CHOUCANE MLIK**
HEAD OF SERVICE

**NATIONAL CENTER
OF PATHOLOGY (NCP)**

**EXZELLENZ-LABOE
WÉI DEN LNS STINN AN
DIREKTER KONKURRENZ
MAT ANER LABORATOIREN.
AN DEEM ËMFELD ASS EIST
OBJEKTIV NATIERLECH
LEADER ZE SINN AN ZE
BLEIWEN. DOFIR ASS
ET WICHTEG DÉI SCHO
BESTOEND KOMPETENZ MAT
EFFIKASSITÉIT ZE BENOTZEN,
VIRUN ALLEM WANN
D'EQUIPE A BESTÄNNEGER
ENTWÉCKLUNG ASS.**

NATIONAL CENTER OF PATHOLOGY (NCP): SPECIALISATION DELIVERS LASTING ADDED VALUE

Pathology, from Greek: the study of suffering, is a vast field. In order to be able to pursue these tasks even more efficiently, the pathologists of the LNS initiated a process of specialisation in recent years, which started showing lasting effects in 2019.

The National Center of Pathology (NCP) is the largest department of the LNS, with a total of more than 90 staff spread over two major areas. While the Pathological Anatomy laboratory diagnoses cancerous or precancerous conditions and inflammatory or malformative diseases, the Gynaecological Cytology laboratory's main task is to detect cervical cancer. Both services have grown steadily in recent years, which has led to new challenges, especially in the case of the Pathological Anatomy Service.

EVERY EMPLOYEE HAS SOMETHING SPECIAL TO OFFER



“In a laboratory like the NCP, which sets itself the highest standards of excellence, it is important to make efficient use of existing expertise, especially when the team is growing steadily,” says Dr. Olfa Chouchane Mlik. This is the most appropriate way to fulfil the role of a modern healthcare player and to be able to react sustainably and flexibly to the changing demands of clients and partners: “Laboratories of excellence like the LNS compete with other laboratories. In this competition, of course, our goal is to be a leader.”

In order to achieve this goal, the NCP relies, among other things, on specialisations, and with good reason. Olfa Chouchane Mlik: “Pathology is a particularly multifaceted job, and the same goes for the skills of our team members. Both in terms of training and experience, each member of the team is different, has something special to offer.” Bundling this range of skills together is therefore part of the long-term structural specialisation process that Olfa Chouchane Mlik is helping to shape in organisational terms.

SPECIALISATION PROCESS INITIATED IN 2017



Olfa Chouchane Mlik is a medical pathologist with many years of international experience mainly in France – including experimental research projects at the renowned Institut Curie in Paris. This experience and the resulting conviction that specialisation fosters excellence are what drive her motivation to bring about a more efficient organisation of the NCP.

The specialisation process was initiated at the beginning of 2017. From the first moment, a clear structure was devised for each group of specialists, based on their respective individual competencies, as Olfa Chouchane Mlik explains: “Each of our pathologists has two or three essential specialisations. By combining all this extensive expertise into competence clusters, we have succeeded in efficiently structuring our pool of individual excellence, thus providing concentrated added value to patients.”

SIGNIFICANT AND NECESSARY RESULTS IN 2019

Two years later this reorganization bore tangible and much-needed fruit. Olfa Chouchane Mlik continues: "Our Unit had recorded further, significant growth in 2017 and 2018, and by the beginning of 2019 this structured approach to our projects had very much become a necessity. This was all the more the case as we also grew in terms of our involvement in research projects over the same period. In Luxembourg, for example, we have further intensified our cooperation with the LIST, the LIH and the INC. We also cooperate with partners in neighbouring countries."

An essential part of this specialisation approach is a culture of responsibility that (pro)actively involves each individual and relies on clear processes. Dr. Olfa Chouchane Mlik: "Overall, we currently have 14 groups (see box), each of which has a leader who is responsible for communication with our correspondents and our different partners. Conversely, each team member is called upon to contribute their own ideas to our daily work, with the aim of systematically expanding our in-house competence on the one hand, and meeting internationally valid excellence criteria on the other."



THE 14 GROUPS BY SPECIALISATION:

- > SKIN PATHOLOGY
- > UROPATHOLOGY
- > GASTROINTESTINAL PATHOLOGY
- > GYNECOPATHOLOGY
- > LUNG PATHOLOGY
- > SOFT TISSUE & BONE
- > CYTOPATHOLOGY
- > AUTOPSY
- > FETAL/PLACENTAL PATHOLOGY
- > HEMATOPATHOLOGY
- > NEUROPATHOLOGY
- > HEAD AND NECK PATHOLOGY
- > LIVER PATHOLOGY
- > MOLECULAR PATHOLOGY

NATIONAL CENTER OF PATHOLOGY (NCP) : LA SPÉCIALISATION APPORTE UNE VALEUR AJOUTÉE DURABLE

Le National Center of Pathology (NCP) est le plus grand département du LNS. Afin de pouvoir poursuivre ses tâches encore plus efficacement, un processus de spécialisation a été initié ces dernières années, et a commencé à montrer des effets durables en 2019.

Les plus de 90 collaborateurs du NCP sont répartis sur deux services. Alors que le laboratoire d'anatomie pathologique a pour mission principale de diagnostiquer les affections cancéreuses ou précancéreuses et les maladies inflammatoires ou malformatives, le laboratoire de cytologie gynécologique a pour tâche principale de dépister le cancer du col de l'utérus. Les deux services ont connu une croissance constante ces dernières années, ce qui a entraîné de nouveaux défis.

CHAQUE EMPLOYÉ A QUELQUE CHOSE DE SPÉCIAL À OFFRIR

« Dans un laboratoire comme le NCP, il est important d'utiliser efficacement l'expertise existante », déclare le Dr Olfa Chouchane Mlik. « C'est la manière la plus appropriée de remplir le rôle d'un acteur moderne des soins de santé et de pouvoir réagir de façon durable et flexible aux demandes changeantes des clients et des partenaires ». Pour atteindre cet objectif, le NCP s'appuie, entre autres, sur les spécialisations. Olfa Chouchane Mlik de continuer : « La pathologie est une discipline particulièrement complexe. Tant en termes de formation que d'expérience, chaque membre de l'équipe a quelque chose de particulier à offrir ».

PROCESSUS DE SPÉCIALISATION INITIÉ EN 2017

Le regroupement de cet éventail de compétences s'inscrit donc dans le processus de spécialisation à long terme qu'Olfa Chouchane Mlik contribue à façonner depuis ses débuts en 2017. En tant que médecin pathologiste ayant de nombreuses années d'expérience principalement en France - dont des projets de recherche expérimentale à l'Institut Curie à Paris - la conviction que la spécialisation favorise l'excellence inspire sa motivation quant à l'organisation efficace du NCP. C'est pourquoi une structure claire a été conçue pour chaque groupe de spécialistes, en fonction des compétences individuelles.

DES RÉSULTATS SIGNIFICATIFS ET NÉCESSAIRES EN 2019

« Chacun de nos pathologistes a deux ou trois spécialisations. En combinant cette vaste expertise en pôles de compétences, nous avons réussi à structurer notre pool d'excellence individuelle, apportant ainsi une valeur ajoutée concentrée sur l'intérêt du patient », poursuit Olfa Chouchane Mlik. Deux ans plus tard, cette réorganisation a porté des fruits tangibles : « Notre unité a enregistré une nouvelle croissance en 2017 et 2018. Et, début 2019, cette approche structurée de nos projets était devenue une nécessité. C'était d'autant plus vrai que nous avons également connu une croissance en terme d'implication dans des projets de recherche de d'excellence de la recherche. Au Luxembourg, nous avons encore intensifié notre coopération avec le LIST, le LIH et l'INC. Nous coopérons également avec des partenaires dans les pays voisins ».

BASÉ SUR UNE CULTURE DE LA RESPONSABILITÉ

Un élément essentiel de cette approche de spécialisation est la culture de la responsabilité qui implique (pro)activement chaque individu et qui repose sur des processus clairs. Olfa Chouchane Mlik : « En tout, nous comptons actuellement 14 groupes, dont chacun a un responsable qui est en charge de la communication avec nos correspondants et aussi avec nos différents partenaires. Inversement, chaque membre de l'équipe est appelé à apporter ses propres idées à notre travail quotidien, dans le but d'élargir systématiquement nos compétences internes, d'une part, et de répondre à des critères d'excellence valables au niveau international, d'autre part ».

- Electron microscopy platform with correlative IF imaging established
- Epigenetic platform established
- Automated cell block device established
- Scanning pathology started for neuropathology, uropathology and GI pathology
- Molecular pathology: shared workflow with NCG established (multiple new diagnostic tests established in 2018/2019)
- Official ethical approval for brain banking obtained in September 2019
- 1 research prize won: *Espoir en tête* (Epigenetic control of brain plasticity in AD)
30,000 € to Dr. David Bouvier, Dr. Alexander Skupin, Prof. Dr. Michel Mittelbronn

PATHOLOGICAL ANATOMY

115,641

BIOPSIES, NON-GYNAECOLOGICAL SMEARS
AND OPERATIVE SPECIMENS

593

HAEMATOLOGICAL CYTOLOGY, HAEMOSTASIS
AND COAGULATION ANALYSES

17

CLINICAL AUTOPSIES

KEY FACT

**GYNAECOLOGICAL
CYTOLOGY**

130,238

**CERVICAL-VAGINAL SMEARS
(IN LIQUID-BASED CHROMATOGRAPHY AND CONVENTIONAL)**

33,927

**MOLECULAR BIOLOGY ANALYSES:
HUMAN PAPILLOMAVIRUS DETECTION (HPV-HR)**

191,671

ANALYSES IN TOTAL

4,514

**MOLECULAR BIOLOGY ANALYSES:
HUMAN PAPILLOMAVIRUS GENOTYPING (HPV-GT)**

15,427

**MOLECULAR BIOLOGY ANALYSES:
CHLAMYDIAE TRACHOMATIS AND NEISSERIA GONORRHAEEAE
(COMBINED TEST: COMBO 2)**

7,565

**MOLECULAR BIOLOGY ANALYSES:
MYCOPLASMA GENITALIUM (MGEN)**

TS AND FIGURES



2.6

^ DR. PHARM.-BIOL. DOMINIQUE BOURGEOIS
HEAD OF UNIT

**NATIONAL CENTER
OF GENETICS (NCG)**

**EIS STÄERKT ASS EIS
VILLFÄLTEGKEET: DEE
SELWECHTE SERVICE
ASS AN ENGEMS VIR DEN
DEPISTAGE WÉI OCH VIR
D'DIAGNOS ZOUSTÄNNEG.
EE WEIDERE STAARKE
PUNKT ASS EIS FÄEGKEET
MAT EFFIKASSITÉIT MAT
DEN ANEREN UNITÉITE
VUM „NATIONAL CENTER
OF GENETICS“ ZESUMMEN
ZE SCHAFFEN AN
HINNE GÉIGENIWWER
REAKTIOUNSFÄEG ZE SINN.**

NATIONAL CENTER OF GENETICS: NON-INVASIVE PRENATAL TESTING (NIPT) FOR TRISOMIES NOW PERFORMED AT THE LNS

The Cytogenetics Unit is one of the pillars of the LNS's National Center of Genetics (NCG). The team has long-standing expertise in the diagnostics of chromosomal disorders both in the postnatal and prenatal settings. For many years, the Unit has been performing invasive prenatal diagnoses for pregnancies with increased risks of foetal chromosomal abnormalities, e.g. in the context of advanced maternal age or if foetal anomalies are detected by ultrasound. Amniotic fluid or chorionic villus samples are analysed using conventional and molecular cytogenetics (invasive) techniques to reach an accurate and secure diagnosis for these pregnancies.

Starting from 1 August 2019, Non-Invasive Prenatal Testing (NIPT) for trisomy 21 (Down syndrome), trisomy 13 (Patau syndrome) and trisomy 18 (Edwards syndrome) has been implemented in the Cytogenetics Unit, in close collaboration with the Molecular Genetics Unit of the NCG. NIPT, sometimes called Non-Invasive Prenatal Screening (NIPS), is a screening test for the most common foetal chromosomal abnormalities, such as trisomies 21, 18 or 13. The test analyses small fragments of free foetal DNA circulating in maternal blood and is based on state-of-the-art Next-Generation Sequencing (NGS) technology. It is very reliable and poses no risk to the foetus. With its implementation in 2019, the LNS is the first laboratory to perform NIPT in Luxembourg. Although future parents have been familiar with NIPT for some years now, before 2019 all tests had to be carried out abroad.

NIPT: A TECHNOLOGICAL LEAP FOR THE CYTOGENETICS UNIT

“The introduction of NIPT has been a technological leap for us, as this new screening method uses a fully automated NGS-based workflow,” says Dr. Pharm.-Biol. Dominique Bourgeois, geneticist and head of the unit. NGS technology is capable of reading – “sequencing” – large fractions of DNA simultaneously. NIPT brings together a set of methods that make it possible to detect overrepresentation of foetal DNA in the mother’s blood. At the National Center of Genetics, all the necessary medical expertise (cytogeneticists, molecular biologists, bioinformaticians, clinical geneticists) was already available and the Molecular Unit of the NCG, headed by Dr. sc. Daniel Stieber had been performing NGS for several years. For implementation of NIPT, we decided to use the Illumina VeriSeq NIPT solution, allowing for an automated sample preparation workflow that can process up to 96 samples at the same time. The technicians as well as the scientific and medical team of the Cytogenetics Unit were of course specifically trained in using the Illumina VeriSeq NIPT automated platform. Sample sequencing is performed on the sequencing platform of the Molecular Genetics Unit. This is a major technological breakthrough for the Cytogenetics Unit, which relies on Next-Generation Sequencing technology for NIPT.

COMPREHENSIVE, COLLABORATING TEAMS

The Cytogenetics Unit now completely covers postnatal chromosomal abnormality diagnosis, prenatal chromosomal abnormality diagnosis, and prenatal screening. “Our strong point is our versatility: the same unit handles both screening and diagnosis,” says Dominique Bourgeois. If the NIPT screening shows a positive result, the same team then carries out the necessary prenatal invasive diagnostic analyses, following an invasive amniotic fluid sampling procedure. Another strength is that the NCG covers the complete spectrum of genetics – including clinical genetics consultations, as well as molecular and cytogenetics diagnostics – allowing us

to work efficiently together to manage complex cases. Genetic consultations for women and couples with complicated pregnancies are carried out on site at the LNS, at the Clinical Genetics Unit. When handling cases, the cytogeneticists and the clinical geneticists of the NCG work closely with each other and with gynaecologists in Luxembourg. Cases are discussed internally in weekly meetings at the NCG and with gynaecologists and clinicians of other disciplines in the weekly prenatal meetings at the Centre Hospitalier de Luxembourg (CHL), allowing for comprehensive care for women with complicated pregnancies in Luxembourg.

THE FUTURE OF PRENATAL TESTING AT THE NCG

Although the implementation of NIPT is recent and it will take time to draw up a complete assessment, the first results seem to be very convincing. With more than 7,000 NIPT tests carried out at the NCG since it was rolled out in-house in August 2019, a very low failure rate of 0.2% and an average result delivery time of 5 days, we are at the same level of excellence as the reference centres located abroad that perform the same test. Moreover, in 2019, we successfully took part in the first international external quality assessment (EQA) for NIPT together with 125 laboratories from 35 different countries.

“Beyond NIPT, which remains a screening method, the development of NGS technology will make it possible to establish precise prenatal diagnoses and thus improve patient care; provided, of course, that that development always goes hand in hand with specific consultations,” Dominique Bourgeois adds, and concludes more broadly by saying: “Non-invasive techniques should also be developed for conditions other than chromosomal anomalies.” Developments that both doctors and patients can look forward to.

NCG : LES TESTS PRÉNATAUX NON INVASIFS (NIPT) RÉALISÉS DÉSORMAIS AU SEIN DU LNS

L'unité de cytogénétique est l'un des piliers du National Center of Genetics (NCG) du LNS. L'équipe possède une expertise de longue date dans le diagnostic des anomalies chromosomiques, tant en postnatal qu'en prénatal. Depuis de nombreuses années, l'unité réalise un diagnostic prénatal invasif pour les grossesses présentant un risque accru d'anomalies chromosomiques fœtales, comme par exemple en cas d'âge maternel avancé ou si des anomalies fœtales sont détectées par échographie. Des échantillons de liquide amniotique (amniocentèse) ou de villosités choriales (biopsie de trophoblaste) sont analysés à l'aide de techniques de cytogénétique conventionnelle et moléculaire afin de parvenir à un diagnostic précis.

Depuis le 1^{er} août 2019, le dépistage prénatal non invasif (non-invasive prenatal testing - NIPT) a été mis en place dans l'unité de cytogénétique en étroite collaboration avec l'unité de génétique moléculaire du NCG. Le NIPT est un test de dépistage des anomalies chromosomiques fœtales les plus courantes, telles que la trisomie 21 (syndrome de Down), la trisomie 18 (syndrome d'Edwards) ou la trisomie 13 (syndrome de Patau). Le test, basé sur la technologie de pointe de séquençage nouvelle génération (Next-Generation Sequencing - NGS), analyse de petits fragments d'ADN fœtal libre circulant dans le sang maternel. Il est très fiable et ne présente aucun risque pour le fœtus. Avec sa mise en place en 2019, le LNS est le premier laboratoire au Luxembourg à réaliser les tests NIPT, qui auparavant étaient tous effectués à l'étranger.

NIPT : UN BOND TECHNOLOGIQUE POUR L'UNITÉ DE CYTOGÉNÉTIQUE

« L'introduction du NIPT a été une avancée technologique pour nous, car cette nouvelle méthode de dépistage utilise la technologie NGS et repose sur une automatisation complète du processus. », déclare le Dr Pharm.-Biol. Dominique Bourgeois, généticien et chef d'unité : « La technologie NGS est capable de lire – « séquencer » - de grandes quantités d'ADN simultanément. Si le fœtus est porteur d'un chromosome supplémentaire (trisomie), le test NIPT permet de détecter directement dans le sang de la mère la surreprésentation de l'ADN fœtal dûe à ce chromosome supplémentaire. Au NCG, toute l'expertise médicale nécessaire était déjà disponible, et le NGS est effectué depuis plusieurs années dans l'unité de génétique moléculaire, dirigée par le Dr sc. Daniel Stieber. Pour la mise en œuvre du NIPT, nous avons décidé d'utiliser la solution NIPT d'Illumina VeriSeq, qui permet un flux de préparation automatisé des échantillons pouvant traiter jusqu'à 96 échantillons en même temps. Les techniciens ainsi que l'équipe scientifique et médicale de l'unité de cytogénétique ont évidemment été formés à l'utilisation de la plateforme Illumina VeriSeq NIPT. Le séquençage des échantillons est effectué sur la plateforme de séquençage de l'unité de génétique moléculaire. Il s'agit d'une avancée technologique majeure pour l'unité de cytogénétique. »

DES ÉQUIPES POLYVALENTES ET QUI COLLABORENT ENTRE ELLES

L'unité de cytogénétique est donc capable de proposer le dépistage prénatal des anomalies chromosomiques avec la technique NIPT, mais également d'assurer le diagnostic d'anomalies chromosomiques prénatales. En effet, si le dépistage NIPT montre un résultat positif, la même équipe effectue les analyses chromosomiques à l'issue d'un geste invasif. L'unité assure également le diagnostic des anomalies chromosomiques postnatales, ce qui permet donc de proposer un diagnostic complet des anomalies chromosomiques.

Un autre atout du NCG est sa capacité à travailler en étroite collaboration avec les différents intervenants permettant une prise en charge multidisciplinaire efficace des cas complexes. Les cas sont discutés chaque semaine en interne au NCG, et avec des gynécologues et des cliniciens d'autres disciplines lors de réunions au Centre Hospitalier de Luxembourg (CHL). Ceci permet une prise en charge adaptée des femmes ayant des grossesses compliquées au Luxembourg. « Au-delà du NIPT, qui reste un test de dépistage, le développement de la technologie NGS permettra d'établir des diagnostics prénataux précis et donc d'améliorer la prise en charge des patientes ; à condition, bien sûr, que ce développement aille toujours de pair avec des consultations spécifiques », ajoute Dominique Bourgeois, qui conclut : « Des techniques non invasives devraient également être développées pour d'autres pathologies que les anomalies chromosomiques ». Des développements que les médecins et les patients attendent avec impatience.

Since its start in 2018, the NCG has undergone profound development. Aiming at building up a recognised academic center, the NCG accomplished important tasks in 2019:

- 8 highly qualified professionals were recruited, including 2 medical doctors with specialisation in genetics, a bioinformatician, and 3 highly-skilled technicians, increasing our personnel to a total of 37 employees.
- The overall numbers of genetic tests we performed more than doubled compared to 2018, from around 7,000 to 14,700. We also have constantly increased our portfolio by implementing novel tests and technologies, such as non-invasive prenatal testing (NIPT).
- We successfully participated in 42 different external quality controls, covering the full spectrum of cytogenetic and molecular genetic tests, including next generation sequencing (NGS) -based diagnostics.
- The NCG is part of the *Comité National Maladies Rares*, and we actively participated in 9 working groups of the *Plan National Maladies Rares* (PNMR).
- Dr. Barbara Klink is one of the nominated national representatives for Luxembourg in the European “1+Million Genomes” initiative (1+MG).
- Dr. Barbara Klink established the research group “Functional Tumor Genomics” at the Department of Oncology at LIH, further strengthening collaboration with the LIH.

1,467

CYTOGENETIC ANALYSES

2,434

NON-INVASIVE PRENATAL TESTS (NIPT)

CYTOGENETICS

The Cytogenetics Unit applies classical (e.g. conventional karyotyping) and advanced molecular techniques (e.g. microarrays, next generation sequencing) for the diagnosis of constitutional chromosomal disorders in the post- and prenatal context.

- A major success in 2019 was the implementation of in-house Non-Invasive Prenatal Testing (NIPT) for the screening of aneuploidies. Since August, the Unit has carried out about 150 tests per week, offering NIPT to all inhabitants of Luxembourg.
- The Unit increased its activity in postnatal constitutional diagnostics. Molecular karyotyping using array CGH (Comparative Genomic Hybridization) is routinely performed as a first-tier diagnostic for patients with intellectual disability, cognitive impairment, or autistic spectrum disorder.
- As part of long-term-collaboration with SOS DIGEAL (established to support the development of genetic diagnostics in Argentina), Ivana Primost, a cytogeneticist from the Centro nacional de genética médica (CENAGEM), Buenos Aires, visited the Unit for one month to gain experience in modern techniques.
- The Unit successfully participated in several international external quality control missions covering all methods used routinely, including the first-ever international quality control for NIPT launched in 2019.

KEY FACT

MOLECULAR GENETICS

The Molecular Genetics Unit offers a broad spectrum of methods to perform constitutional and cancer-related genetic testing. It also hosts the joint LIH-LNS LuxGen-Sequencing platform. Important highlights in 2019 included:

- The consolidation and development of Next Generation Sequencing activities: considerable increase, compared to 2018, in the number of sequencing runs (+ 90%, to > 200 runs) and the amount of sequencing data generated (+ 400%, to >6,000 GB).
- An all-time high for the number of patients (1215) tested for haemoglobin disorders.
- The implementation of a monthly molecular tumour board together with the Institut national du cancer (INC) and the National Center of Pathology.
- The recruitment of an experienced bioinformatician, Dr. Zhi Zhang, to advance the development of novel procedures for next generation sequencing data analysis.
- The defence, by Jimena Murguia of the University of Luxembourg, of her Masters Thesis in Integrated Systems Biology (Title: Performance comparison of four whole-exome capture panels using Orangutan DNA to benchmark variant identification).

5,258

CONSTITUTIONAL GENETIC ANALYSES

1,812

SOMATIC GENETIC ANALYSES

1,255

HEMOGLOBINE SEPARATION
AND QUANTIFICATION CASES

950

PATIENTS AND FAMILIES SEEN
FOR GENETIC CONSULTATIONS

CLINICAL GENETICS

The Clinical Genetics Unit is the interface between patients, hospitals and clinicians of other disciplines, and laboratory genetics services. It is crucial to expand this activity to provide genetic diagnosis, counselling, education, and support for the population of Luxembourg.

In 2019, important steps were taken to achieve this ambitious goal:

- With Dr. Guillaume Jouret's arrival in November, we acquired an excellent medical doctor specialized in clinical genetics to reinforce our team.
- Dr. Barbara Klink received the authorisation for education of medical doctors in the field of human genetics from the *Ärzttekammer des Saarlandes*.
- Monthly meetings with paediatric endocrinologists and neuro-paediatricians of the CHL were established and we took part in the weekly prenatal meeting at the CHL.

HEMATO-ONCOGENETICS

Cytogenomic examinations of haematological malignancies, including conventional karyotyping and fluorescence in situ hybridization (FISH), are the gold standard for the diagnosis of patients with haematological malignancies. The spectrum of diagnoses performed in the unit covers all indications such as AML, CML, ALL, CLL, MPN, MDS, CEL/HES, NHL and MM. The team and the number of cases are constantly growing.

- In November, Dr. Seval Türkmen took charge of the Unit. Dr. Türkmen is a medical doctor specialised in genetics. Before joining the LNS family, she was the head of the Cancer Cytogenetics Department at the Charité hospital in Berlin.
- In October, Nelson Dionisio and Jean Houben joined the team as technicians. They will help the Unit to further expand the diagnostics portfolio to cover the complete diagnostics of haematological malignancies for Luxembourg and build up translational research activities.
- In 2019, the Unit successfully participated in 14 international quality controls for chromosome analysis, molecular cytogenetic analysis, B cell clonality and qRT-PCR BCR/ABL1.

1,336

CYTOGENETICS AND MOLECULAR GENETIC ANALYSES

2,812

FISH ANALYSES

KEY FACTS AND



FIGURES



2.7

^ **THOMAS WEGNER**
HEAD OF SERVICE

**ADMINISTRATION, FINANCE
& SUPPORT SERVICES**

**DUERCH EISEN DEEGLECHE
BOTZDÉNGSCHT GËTT
SÉCHERGESTALLT, DASS
WÄREND DEM DUERCHFÉIERE
VUN DEN ANALYSEN, DÉI
NÉIDEG HYGIÈNESMESURË
BERÉCKSIICHTET GINN.
AN DEEM KONTEXT ASS
ET OCH ERFREELECH
FESTZESTELLEN, DASS EIST
PERSONAL DËS WESENTLECH
AARBECHT ËMMER OP EN
NEITS AN OP ALL NIVEAU
ZE SCHÄTZE WEESS.**

BECAUSE HEALTH & HYGIENE GO HAND IN HAND: INFRASTRUCTURE & LOGISTICS ENHANCES CLEANING SERVICES WITH SUSTAINABILITY IN MIND

Health and hygiene go hand in hand. That's why we should strive for excellence with our cleaning service too. With this in mind, the LNS chose to re-organise its cleaning service in 2019. In-house expertise was supplemented with specifically selected external competence.

For a leading player in the healthcare sector, abiding by high quality standards also means acting as a role-model. In order to live up to this, a number of parameters must permanently be guaranteed. Alongside things like academic excellence, or first-class technical infrastructure, some more "everyday" considerations also play a key role – and so do the people in charge of delivering on them professionally and reliably.

It is the Infrastructure & Logistics team that provides these services within the LNS, it is the backbone that supports the work of the 'core' laboratory departments. This includes as one key element the cleaning service team, which was re-evaluated and reorganised in 2019 to meet changing requirements.

ACCREDITATIONS REQUIRE HIGH HYGIENE STANDARDS

These requirements are very demanding, and this is due in part to the fact that many LNS departments hold special accreditations. Such accreditations provide complete proof of compliance with relevant cleaning and hygiene standards – which in itself underlines just how important the cleaning team is for the functioning of the LNS, as Thomas Wegner, Head of Infrastructure & Logistics explains:

“The team’s daily work ensures that the general sanitary conditions for the executed analyses are adhered to. Conscientious cleaning of the laboratories is the basis for maintaining high quality standards. In addition thoroughness and reliability are virtues that are indispensable for laboratory cleaning at the LNS.”

AN ENVIRONMENT THAT REQUIRES COMPETENCE AND OCCUPATIONAL SAFETY GUARANTEES

The members of the cleaning team are on duty both during the day and in the evening, and their tasks are varied. Since a laboratory is a different environment from a “normal” office based company, occupational safety is of particular importance to hygiene experts.

Thomas Wegener: “When cleaning in the laboratory, one can be exposed to a wide variety of risks. These range from biological hazards, from medical samples, to chemical hazards from reagents. Avoiding these risks requires special expertise – which also means that each individual member of the cleaning team knows their limits. All this can only be achieved through permanent employee training and awareness-raising.”

A TENDERING PROCESS WITH DETAILED SPECIFICATIONS

In order to set up a future-proof strategy of excellence to tackle these challenges, the cleaning team underwent a sustainability-oriented overhaul in 2019. Most notably, the performance specifications for the external experts, who reinforce the LNS’ own 12-person strong team, were renewed. Under the supervision of the LNS, they will also take over the basic cleaning of the premises of the two tenants of the LNS facilities, IBBL (Integrated BioBank of Luxembourg) and LMVE (Laboratoire de Médecine Vétérinaire de l’Etat).

The complexity of the cleaning team’s tasks required a detailed tendering process, as Thomas Wegner explains: “When selecting the external service provider to provide its expertise, particular attention was paid to ensuring the company and its staff had sufficient experience in the healthcare sector. To this end, very detailed specifications were drawn up, describing the type and frequency of the work to be carried out.”

FURTHER IMPROVEMENT OF OCCUPATIONAL SAFETY

In Thomas Wegner’s view, the targeted restructuring of the cleaning team represents a further important step in the development of the service – and of the entire LNS. Others will follow: “The next step is to revise, standardise and formalise the existing work plans. In addition, the safety concept for laboratory cleaning will be revised together with our occupational safety expert. This is necessary to further minimize risks for our employees.”

The bottom line is that Thomas Wegner believes that the LNS cleaning service will be up to date after the changes initiated in 2019: “The way we are positioned now, we are fit for the coming years and are in an even better position to offer our colleagues the required hygiene conditions. In this context, it is also pleasing to see that the appreciation of the cleaning team is increasing and that respect for this indispensable expertise is being shown more and more at all levels.”

INFRASTRUCTURES & LOGISTIQUES AMÉLIORE DURABLEMENT LE SERVICE DE NETTOYAGE

Santé et hygiène vont de pair. C'est dans cet esprit que le LNS a réorganisé son service de nettoyage en 2019. Le savoir-faire interne a été complété par des compétences externes.

Pour un acteur de premier plan dans le secteur de la santé, le respect de normes de qualité élevées implique également d'agir en véritable modèle. Outre l'excellence académique ou une infrastructure technique de premier ordre, des considérations plus « quotidiennes » jouent également un rôle clé, tout comme les personnes chargées de les mettre en œuvre. C'est l'équipe infrastructures & logistiques qui fournit ces services essentiels au sein du LNS. Et l'un de ses éléments clés est l'équipe du service de nettoyage, réorganisée en 2019.

LES ACCRÉDITATIONS EXIGENT DES NORMES D'HYGIÈNE ÉLEVÉES

Ces exigences sont très strictes, dû au fait que de nombreux départements du LNS détiennent des accréditations spéciales. Ces accréditations attestent la conformité complète aux normes de nettoyage et d'hygiène applicables. Thomas Wegner, responsable du service infrastructures & logistiques, explique : « Le travail quotidien de l'équipe garantit le respect des conditions sanitaires nécessaires pour la réalisation optimale des analyses. Le nettoyage consciencieux des laboratoires est la base du maintien des normes de qualité ».

UN ENVIRONNEMENT QUI EXIGE DES COMPÉTENCES ET DES GARANTIES DE SÉCURITÉ AU TRAVAIL

Les tâches des membres de l'équipe sont variées. Un laboratoire étant un environnement différent d'une entreprise de bureau « traditionnelle », la sécurité au travail revêt une importance particulière pour les experts en hygiène. Thomas Wegner : « Lorsque l'on nettoie dans un laboratoire, on peut être exposé à une grande variété de risques. Éviter de tels risques requiert une connaissance particulière ».

UNE PROCÉDURE D'APPEL D'OFFRES AVEC UN CAHIER DES CHARGES DÉTAILLÉ

Afin de relever ces défis, l'équipe de nettoyage a été remaniée en 2019. En particulier, le cahier des charges de performance des professionnels externes, qui renforce l'équipe de 12 personnes du LNS, a été renouvelé. La complexité des tâches a nécessité une procédure d'appel d'offres détaillée : « Lors de la sélection du prestataire de services externe, une attention particulière a été accordée pour s'assurer que l'entreprise et son personnel avaient l'expérience nécessaire dans le secteur des soins de santé ».

L'AMÉLIORATION DE LA SÉCURITÉ AU TRAVAIL SE POURSUIT

Selon Thomas Wegner, la restructuration de l'équipe de nettoyage représente une nouvelle étape importante dans le développement de l'ensemble du LNS. D'autres suivront : « La prochaine étape consiste à réviser, standardiser et formaliser les plans de travail existants. En outre, le concept de sécurité pour le nettoyage des laboratoires sera révisé en collaboration avec notre expert en sécurité du travail. Ceci est nécessaire pour minimiser encore plus les risques pour nos employés. Dans ce contexte, il est également agréable de constater que l'ensemble de notre personnel respecte à tous les niveaux le travail essentiel et professionnel réalisé par notre équipe de nettoyage ».

IT

E-DOCTOR PROJECT

After a pilot in 2018 with a panel of 20 doctors, the test was extended in 2019. More than 100 doctors now receive LNS reports electronically – without postal delays, and with automated integration into their patient software. In 2019 this represented nearly 40,000 documents.

LUXTRUST ELECTRONIC STAMP

In parallel, the LNS has partnered with LuxTrust so that all documents sent by this means include an electronic stamp certifying the authenticity and integrity of the document.

RECRUITMENT OF 2 LIMS ENGINEERS

LIMS is the software at the heart of computerized laboratory management. Thanks to the recruitment of two new LIMS engineers, the LNS will be able to improve or set up new automated flows between the different systems involved in certain processes, enabling more reliable and faster processing of data concerning samples, analyses and even diagnoses.

REMOTE ASSISTANCE TOOL

The LNS has acquired a new remote assistance tool. This tool enables rapid intervention on particular systems, in a secure and fully audited manner. For example, it enables support teams to intervene quickly if necessary. The tool is also deployed in the telepathology rooms installed in Luxembourg's hospitals, allowing hospital staff to keep a link with the teams at the LNS.

ENERGY CONSUMPTION

5,390.6

MWH ELECTRICITY

676,349

M³ NATURAL GAS

2,494

MWH HEAT

2,361

MWH COLD

KEY FACT

INFRASTRUCTURE AND LOGISTICS

Customization of a special workspace for the high-end electron microscope for the National Center of Pathology. (February)

Development of a new strategy for the insourcing of sample transport, built around professionally equipped vans, a state-of-the art temperature monitoring system and well-trained LNS drivers. In July, the board of directors approved the new strategy. (Q1 & Q2)

Public tender for the general cleaning of the building. The purpose of the tender was to conclude a new 5-year contract with a highly skilled service provider.

Implementation of an energy monitoring system (with ± 300 smart meters for electricity, heat production and distribution, cooling water production and distribution). The purpose is to detect wastage of energy and reduce energy consumption. (August)

Signing of rental and service agreement with LIH/IBBL. (December)

CENTRAL WAREHOUSE



OUTWARD STOCK MOVEMENTS

7,584

STOCK MOVEMENTS FROM CENTRAL WAREHOUSE TO LNS DEPARTMENTS

3,797

STOCK MOVEMENTS FROM CENTRAL WAREHOUSE TO EXTERNAL PARTNERS

INWARD STOCK MOVEMENTS

1,902

STOCK MOVEMENTS FROM VENDORS TO CENTRAL WAREHOUSE

HUMAN RESSOURCES

Key role in change management and roll out of the "Together LNS" initiative.

Building a strong HR team and a modern HR service delivery model.

- Day to day professional support, coaching and advice to leadership team and colleagues on people management.
- Established strong relations with key stakeholders and teams, also through HR breakfasts with all teams throughout 2019.
- Specialized training and coaching of HR professionals, with a focus on HR operations and public employee administration.
- Completion of HR Operations process mapping and documenting for private and public employees.

High recruitment volumes underpinning growth and organizational development, including onboarding and integration of key senior roles throughout the organization as well as approximately 70 students, interns and visiting researchers.

Established strong partnership with staff representatives – private employees staff delegation in particular (elected for the first time in March 2019 at the LNS).

276.9

FULL-TIME EQUIVALENTS

25

NEW POSITIONS (EXCLUDING REPLACEMENTS)

36

NEW RECRUITS (11 FIXED-TERM AND 24 PERMANENT CONTRACTS)

41.59

YEARS: STAFF'S AVERAGE AGE

62.78%

WOMEN

37.22%

MEN

20

NATIONALITIES REPRESENTED
(EXCLUDING REPLACEMENTS)

FINANCE

- The Service welcomed a new manager at the beginning of 2019, Laurence Lebois, who provides experience acquired in international private sector companies and in “Big 4” firms.
- The Finance team worked closely with the National Center of Pathology and National Center of Genetics, as well as with the IT team on the configuration and implementation of invoicing in accordance with the law governing hospitals. Since April 2018, the NCP and the NCG have been financed by the CNS.
- CNS funding also implies the submission of a separate budget according to a different presentation and accounting standards from the budget to be presented to the Ministry of Health. This was one of the other major tasks of the department.
- To cope with the increased volumes of incoming and outgoing invoices, the Service is still actively seeking to automate these processes.

KEY FACTS AND FIGURES

3.0



**KEY FIGURES
2019**

CHAZA

STAFF



62.78%

WOMEN



37.22%

MEN



276.9

FULL-TIME EQUIVALENTS



25

NEW POSITIONS
(EXCLUDING REPLACEMENTS)



36

NEW RECRUITS
(FIXED-TERM AND
PERMANENT CONTRACTS)

KEY FIGURES

41.6



AVERAGE AGE OF STAFF

20



NATIONALITIES

(ARGENTINA, AUSTRIA, BELGIUM, BOSNIA, BRAZIL, CHINA,
FRANCE, GEORGIE, GERMANY, GREAT BRITAIN, HUNGARY,
ITALY, JAMAICA, LUXEMBOURG, THE NETHERLANDS,
PORTUGAL, ROMANIA, SPAIN, SWITZERLAND, UNITED STATES)

TOTAL INCOME

55,299,178.05 €

KEY FIGURES

3.1

**ACTIVITIES DEPARTMENT
BY DEPARTMENT**



NCP

115,641

BIOPSIES, NON-GYNAECOLOGICAL
SMEARS AND OPERATIVE SPECIMENS

593

PCR ANALYSES IN HAEMATOLOGICAL CYTOLOGY,
HAEMOSTASIS AND COAGULATION

17

AUTOPSIES

191,671

GYNAECOLOGICAL CYTOLOGY ANALYSES



MICROBIOLOGY

16,077

PCR ANALYSES IN VIROLOGY

15

CELL
CULTURES

37,731

BACTERIOLOGY, MYCOLOGY AND ANTIBIOTIC
RESISTANCE ANALYSE

30,911

SEROLOGY ANALYSES

1,160

WHOLE GENOME



FORENSIC MEDECINE

9,498

GENETIC IDENTIFICATIONS

3,961

EXPERTISE REQUESTS IN FORENSIC TOXICOLOGY

178

FORENSIC MEDICAL AUTOPSIES
AND EXPERT WITNESS REPORTS

17,350

ANALYSES
(TECHNICAL PLATFORM FOR ANALYTICAL TOXICOLOGY
AND PHARMACEUTICAL CHEMISTRY)



HEALTH PROTECTION

24,539

ENVIRONMENTAL HEALTH AND BIOLOGICAL
MONITORING ANALYSES

17,517

FOOD MONITORING ANALYSES



NCG

13,562

GENETIC ANALYSES



MEDICAL BIOLOGY

106,136

BIOCHEMICAL ANALYSES

3.1



**FINANCIAL
REPORT**



ASSETS

	2019	2018
Fixed assets		
Intangible fixed assets		
Concessions, patents, licenses, trademarks and similar rights	366,425.71	462,625.25
Advances paid and intangible assets in progress	73,021.00	-
	439,446.71	462,625.25
Tangible fixed assets		
Land and buildings	76,266,160.51	79,482,896.14
Technical installations and machines	3,976,219.58	3,873,820.18
Other installations, tools and furniture	827,447.87	822,606.52
Advances paid and tangible fixed assets in progress	140,902.16	5,040.24
TOTAL FIXED ASSETS	81,210,730.12	84,184,363.08
Current assets		
Stocks		
Raw materials and consumables	260,476.59	218,803.42
Debtors		
Trade debtors		
- Becoming due and payable within one year	12,192,407.71	9,404,922.82
Other debtors		
- Becoming due and payable within one year	13,528,603.42	13,938,075.81
- Becoming due and payable after more than one year	384,643.52	288,577.29
Cash at bank and in cash	5,746,542.50	5,097,832.40
TOTAL CURRENT ASSETS	32,112,673.74	28,948,211.74
Deferred cost	501,826.29	178,521.19
TOTAL ASSETS	114,264,676.86	113,773,721.26

LIABILITIES

	2019	2018
Equity		
Retained earnings	8,421,973.60	5,195,323.84
Profit or loss of the year	3,651,462.73	3,226,649.76
Capital investment subsidies	79,578,231.16	82,600,882.48
TOTAL EQUITY	91,651,667.49	91,022,856.08
Provisions		
Other provisions	4,671,037.92	4,516,836.54
Debts		
Trade debts		
- Becoming due and payable within one year	2,811,930.56	2,885,877.33
Other debts		
Tax debts	95,075.11	222,468.68
Social security debts	647,252.93	404,241.21
Other debts: becoming due and payable within one year	13,528,687.03	13,938,407.79
TOTAL DEBTS	17,082,945.63	17,450,995.01
Deferred income	859,025.82	783,033.63
TOTAL LIABILITIES AND EQUITY	114,264,676.86	113,773,721.26

PROFIT AND LOSS ACCOUNT

	2019	2018
Net turnover	30,812,495.51	21,057,348.86
Other operating income	24,486,682.54	30,011,617.82
Use of merchandise, raw materials and consumable materials		
Raw materials and consumable materials	(8,111,939.24)	(6,797,082.04)
Other external expenses	(21,996,450.00)	(19,928,447.63)
Staff costs		
Wages and salaries	(13,307,721.66)	(10,825,027.26)
Social security contributions covering pensions	(943,537.40)	(767,870.10)
Other social expenses	(767,277.17)	(508,890.23)
Value adjustment		
On intangible and tangible fixed assets	(4,905,949.06)	(6,441,424.66)
Other operating expenses	(1,614,529.28)	(2,575,316.06)
Other interests and other financial income		
Other interests and financial income	451.43	2,049.73
Interests and other financial expenses		
Other interests and financial expenses	(762.94)	(308.67)
NET RESULT FOR THE YEAR	3,651,462.73	3,226,649.76



4.0

LNS IN SHORT



GOVERNANCE BODIES

The LNS is a public institution managed by the board of directors. The management of the Laboratory is entrusted to a director assisted by the executive committee and a scientific advisory board.

BOARD OF DIRECTORS¹

The board of directors is the managing body of the LNS. It defines the general policy, organization and functioning of the laboratory in compliance with applicable laws, regulations and conventions.



Members

Delegate from the ministère de la Santé

Prof. Dr Evelin Schröck, president
Dr Jean-Claude Schmit, vice-president
Dr pharm. Cynthia Oxacelay
Mr Xavier Poos
Dr Marc Schlesser
Mrs Lucienne Thommes

Delegates from the ministère de la Justice

Mr Luc Reding
Mr Georges Oswald, expert with an advisory voice

Delegate from the ministère de la Recherche et de l'Enseignement Supérieur

Mrs Josiane Entringer

Delegate from the ministère de l'Economie

Dr Françoise Liners

Delegate from the ministère des Finances

Mr Serge Hoffmann

LNS staff representative

Mr Frank Maas

EXECUTIVE COMMITTEE

The executive committee, composed of the heads of the departments, the heads of the diagnostic centers and the director, meets at regular intervals to coordinate the activity of the institution.

From left to right: Dr. Tamir Abdelrahman, Dr. Andreas Schuff, Dr. Barbara Klink, Prof. Dr. Friedrich Mühlischlegel, Prof. Dr. An Van Nieuwenhuyse, Dr. pharm., Dr. sc. Patricia Borde and Prof. Dr. Michel Mittelbronn.



SCIENTIFIC ADVISORY BOARD

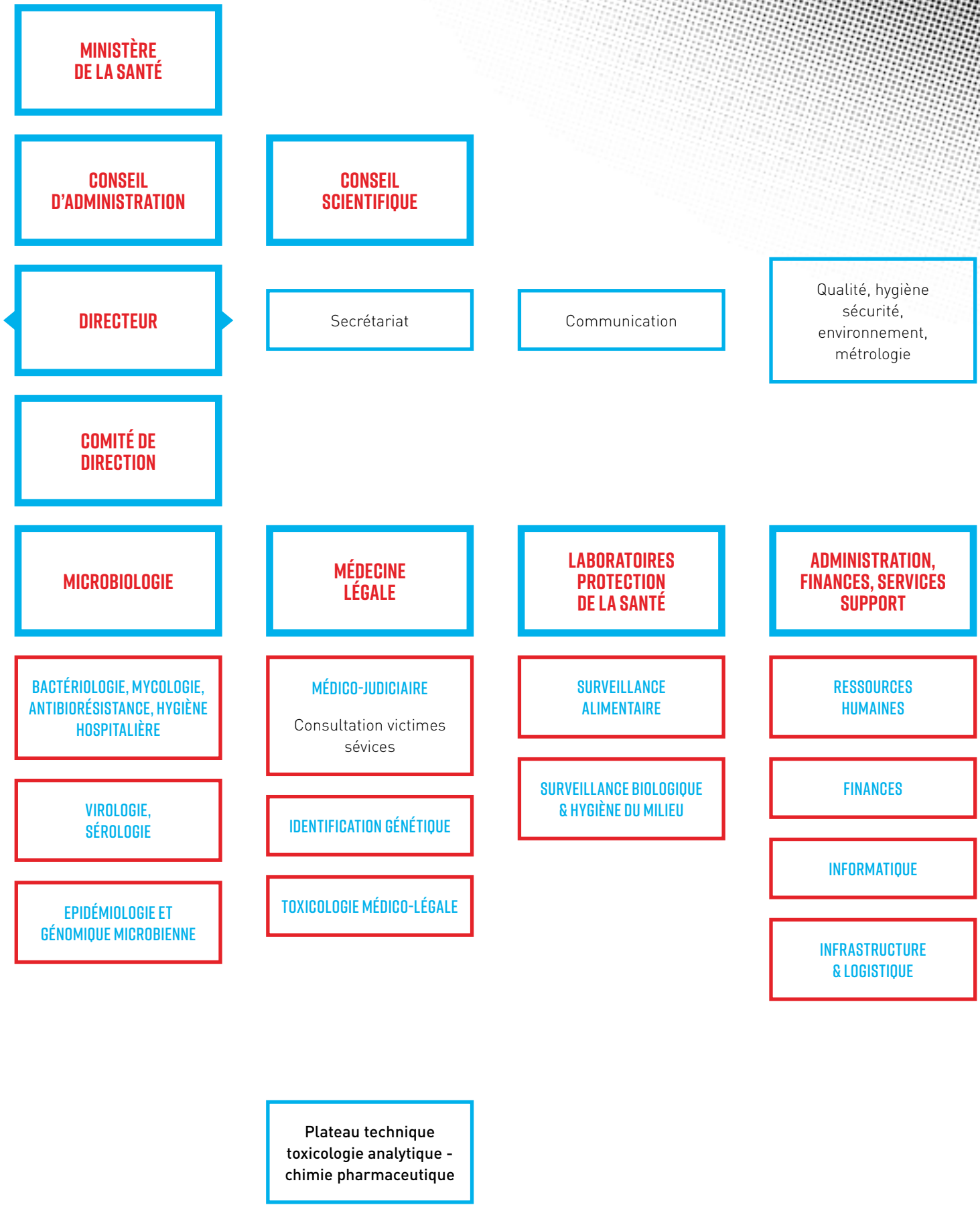
The scientific advisory board, composed of five members chosen among national and foreign experts, is responsible for contributing to the scientific agenda of the institution, expresses its opinion on the strategic plan and comments on the general guidelines for the activities of the laboratory. The scientific advisory board gives its opinion on all matters falling within the area of competence of the institution.

ORGANISATION CHART

as approved by the ministère de la Santé*



ORGANISATION



CHART

*Date of application: 01/01/2018



^ **PROF. DR. EVELIN SCHRÖCK**
PRESIDENT OF THE BOARD

AFTERWORD

Annual reports are normally published in the year that follows the one they cover, and their purpose is to summarise the year in review, in words and in figures. At least, that is normally the case.

The times we are living through, however, are anything but normal. These are uncertain times; a challenge for the people of Luxembourg and its surrounding areas, and indeed for the whole world. Undoubtedly, they are also unprecedented for the LNS, an institution whose mission is to serve Luxembourg and its people with its international team of health professionals.

2020 has so far undoubtedly been an exceptional year for all of us, which is why we are taking the liberty of making an exception with regard to our 2019 annual report, and including a piece on the present in this afterword.

When I took over as Chairwoman of the LNS Board in December 2019, one could fully expect it would be a fascinating task. It would require a high level of passion and commitment to tackle new routes. That was, actually, why I chose to take on the role in the first place. Yet at the time, no one could have been prepared for the fact that a pandemic would engulf the world a few weeks later.

My time at the LNS so far has indeed very much been shaped by COVID-19. In many regards, what I have encountered has confirmed certainties I had held previously. At the same time, I have come across completely new experiences.

As for the confirmed impressions, I appreciate the extremely high standards of research and healthcare in Luxembourg that I had already valued in my previous activities. As for new experiences, I should mention the professionalism and enthusiasm with which the entire LNS team has repeatedly taken on new tasks in the fight against COVID-19 since March 2020. In fact, all the staff, from the hygiene team and the drivers, to the HR and finance specialists, to the laboratory technicians and research experts, have excelled in this. And clearly, without neglecting its existing tasks.

The fact that this has been possible is also the result of numerous steps already taken in 2019 when the board was led by Prof. Dr. Simone Niclou. Consistent and continued professionalisation and reorganisation within the different departments helped the LNS to become more efficient in many areas; and, of course, "Together LNS" has indeed turned a good organisation into an even better one. All of the innovative changes brought about in 2019 and before, have proven their value in the "new challenge" of 2020.

I would like to take this opportunity to thank the entire LNS team and its director, Prof. Dr. Friedrich Mühlischlegel on behalf of all board members. I also wish to thank my fellow board members and my predecessor Prof. Dr. Simone Niclou. We will all be prepared for the next upcoming tasks – in the following weeks as well as in 2021. Together LNS.

Prof. Dr. Evelin Schröck

President of the board

Normalement les rapports annuels sont publiés au courant de l'année qui suit celle qu'ils couvrent, et leur but est de résumer l'année passée, en mots et en chiffres. Du moins, tel est normalement le cas.

Mais les temps que nous vivons actuellement sont tout sauf normaux. Nous vivons une période d'incertitude, un défi pour les habitants du Luxembourg et des régions avoisinantes, voire même pour le monde entier. Sans aucun doute, cette période est aussi sans précédent pour le LNS, une institution dont la mission est de servir le Luxembourg et sa population avec son équipe internationale de professionnels de santé.

L'année 2020 a sans doute été jusqu'à présent une année exceptionnelle pour nous tous, c'est pourquoi nous nous permettons de faire une exception pour notre rapport annuel 2019, et d'inclure dans cette postface un article sur la situation présente.

Lorsque j'ai pris la présidence du conseil d'administration du LNS en décembre 2019, on pouvait s'attendre à ce que ce soit une tâche fascinante qui nécessiterait un niveau élevé de passion et d'engagement pour s'attaquer à de nouvelles voies. C'est d'ailleurs pour cette raison que j'ai choisi d'assumer ce rôle en premier lieu. Pourtant, à l'époque, personne ne pouvait se préparer au fait qu'une pandémie allait engloutir le monde quelques semaines plus tard.

Jusqu'à présent, mon travail au LNS a été fortement influencé par la COVID-19. À bien des égards, ce que j'ai rencontré a confirmé les certitudes que j'avais auparavant. En parallèle, j'ai pu faire des expériences totalement inédites.

Quant aux impressions confirmées, j'estime le niveau extrêmement élevé de la recherche et des soins de santé au Luxembourg que j'avais déjà apprécié dans mes activités précédentes. En ce qui concerne les nouvelles expériences, je dois mentionner le professionnalisme et l'enthousiasme avec lesquels toute l'équipe du LNS a assumé à plusieurs reprises de nouvelles tâches dans la lutte contre la COVID-19 depuis mars 2020. En fait, tout le personnel, de l'équipe d'hygiène et des chauffeurs aux spécialistes des ressources humaines et des finances, en passant par les techniciens de laboratoire et les experts en recherche, a excellé dans ce domaine. Le tout, bien entendu, sans négliger ses tâches habituelles.

Le fait que cela ait été possible est également le résultat de nombreuses mesures déjà mises en place en 2019 lorsque le conseil d'administration était dirigé par le Pr Dr Simone Niclou. La professionnalisation et la réorganisation constantes et continues au sein des différents départements ont ainsi permis au LNS de devenir plus efficace dans de nombreux domaines ; et, bien sûr, « Together LNS » a effectivement permis de transformer une bonne organisation en une organisation encore meilleure. Tous les changements innovants apportés en 2019 et avant ont prouvé leur valeur dans le « nouveau défi » de 2020.

J'aimerais profiter de cette occasion pour remercier toute l'équipe du LNS et son directeur, Pr Dr Friedrich Mühlischlegel, au nom de tous les membres du conseil d'administration. Je tiens également à remercier mes collègues du conseil d'administration et ma prédécesseur, Pr Dr Simone Niclou. Nous serons tous prêts pour les prochaines tâches à venir - dans les semaines à venir ainsi qu'en 2021. Ensemble, le LNS.

Pr Dr Evelin Schröck

Présidente du Conseil d'Administration



25

25

25



5.0

PUBLICATIONS

BSL II

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