



BIOPARK

CHARLEROI BRUSSELS SOUTH

news

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Bacterial persistence: a public health challenge

With FNRS backing since the beginning of the year, a number of publications, and a new ARC project, 2016 has been a good year for Abel Garcia-Pino. Two years after his laboratory opened for business, things are picking up pace for the researcher.



“The laboratory has really changed in two years”, Abel Garcia-Pino is quick to point out. In late 2014, the researcher had just created the **Structural Biology and Biophysics Laboratory (IBMM)** and was eager to begin his research (see Biopark News 24). My team now has two PhD students and a post-doc researcher. We have acquired several pieces of cutting edge equipment and have already been published in major journals like *Nature Communications* and *Nature Chemical Biology*. Things are picking up pace”.

ANTIBIOTIC PERSISTENCE

In addition to an FNRS project launched in early 2016 (see right), the researcher is also involved in an interuniversity research project (ARC) examining the molecular mechanisms of bacterial persistence, a phenomenon in which within bacterial populations, one cell in every million ceases all metabolic activity and enters a latent state. When the population is exposed to lethal stresses, such as antibiotics, these persistent cells survive. Once the stress has passed, these cells may reactivate and recolonise the milieu. These cells are therefore an important factor in resistance to antibiotics, and form a significant threat to public health.

AN AMBITIOUS PROJECT

To study this phenomenon, Abel Garcia-Pino and his team will focus on the mechanisms that trigger the latent state. “*ppGpp*, a molecule synthesised by the RelA enzyme and degraded by the SpoT enzyme, controls the formation of these persistent cells. Our project revolves around this pair of enzymes”, he explains. The researcher will crystallise these proteins so that he can analyse the structure of the enzymes and determine which molecules may potentially modulate their activity. The team will also run superfast screening in the hope of identifying known molecules that bind with these enzymes. “It’s an ambitious project, because RelA and SpoT have several catalytic domains and only become active in contact with ribosomes. These conditions are very difficult to reproduce *in vitro*”, Abel Garcia-Pino explains. After a two-year preparatory period, the researcher will have three years to complete the project. “Bacterial persistence is the main subject that I wanted to research when I set up my laboratory, and now we are finally doing it for real: motivation levels are high”.

Natacha Jordens



MIS PROJECT: BACTERIAL TOXIN-ANTITOXIN SYSTEMS

In early January, the FNRS “MIS” project awarded to Abel Garcia-Pino looked at one of his initial research subjects: toxin-antitoxin systems (TAs), which also play a role in bacterial persistence. As part of the project, the researcher set out to understand what made these toxins potentially fatal, how antitoxins are able to neutralise them, and how these TAs complexes self-regulate. The research has already produced a paper published in *Nature Chemical Biology* in May about the *phd/doc* operon.

Biopark secures 4 ARC!



Researchers at the Biopark have grabbed 4 of the 18 interuniversity research projects (ARC) awarded to the ULB. Abel Garcia-Pino was assigned an ARC "Consolidator" project (read more, opposite), while three of his colleagues are starting work on an "Advanced" ARC for seasoned researchers. Let's take a closer look at these three new projects.

APOL1: A MULTIFACETED PROTEIN

For many years now, David Pérez-Morga, Etienne Pays and their teams in the **Laboratory of Molecular Parasitology (IBMM)** are studying APOL1, a protein found in human serum that can protect against infection by trypanosome. The parasite's sub-species *T.b rhodesiense* has, however, found its way onto the guest list with the protein SRA which neutralises the effects of APOL1.

This ARC project focuses on the relationship between these protein *enemies* and how they work. Researchers suspect that APOLs play a role in the programmed cell death of certain human cells when inflammation is present, as it is when cells encounter a pathogen.

They will also examine the role played by mutated forms of APOL1 in chronic renal disease, which is common in West African populations with trypanosome resistance.

SKIN AND GUT: FINE-TUNED REGULATION OF THE IMMUNE RESPONSE

Earlier research by Stanislas Goriely and his team at the **Institute for Medical Immunology (IMI)** helped demonstrate the role of tristetraprolin (TTP) in controlling inflammation. This protein controls the expression of key inflammation mediators, such as TNF-alpha or Interleukine-23, by degrading their messenger RNAs.

This project focuses on the skin and intestinal mucous: the researchers are using murine models and clinical samples taken from patients suffering from psoriasis in an effort to deepen their understanding of the relationship between TTP and inflammation. They are also evaluating the role that intestinal microbial flora and the skin play in this relationship. The project will also lead to the development of new transgenic tools to observe the degradation of certain messenger RNAs *in vivo*.

HIV RESERVOIRS: REVEALING THE MECHANISM

Patients infected with the human immunodeficiency virus type 1 (HIV-1) must never stop taking their antiretroviral multitherapy in order to keep the virus under control. A small number of infected cells do not express the HIV-1 virus due to latent infection, meaning that it escapes the reach of multitherapy and the host's immune system. These cells form a "reservoir", which is what enables the viremia to rebound once treatment stops.

Carine Van Lint's team (**Molecular Virology Laboratory, IBMM**) will be studying HIV latency in partnership with the Infectious Diseases Department at Saint-Pierre Hospital. It is a complex process controlled on the protein and transcriptional level, as well as by epigenetic modifiers and the structure of virus chromatin embedded in the cellular genome. The aim is to better understand the molecular mechanisms that control HIV-1 latency in order to identify new targets for treatment.

N.J.



New FNRS projects at the IBMM

A number of new FNRS (Belgian Fund for Scientific Research) projects are currently underway within the IBMM. Let's take a look at some of them...

HIV-1: MOLECULAR UNDERSTANDING

Understanding the mechanisms involved in HIV-1 transcription on a molecular level is essential to studying key questions in viral latency and reactivation. The PDR project recently awarded to the **Molecular Virology Laboratory**, managed by **Carine Van Lint**, sets out to study two different phenomena: the transcriptional and epigenetic regulation of an inducible intragenic region that the laboratory recently identified, and the functional role of DNA methylation in HIV-1 latency and new cellular factors involved in the recruitment of enzymes that catalyse DNA methylation. The study's findings should shed light on new molecular mechanisms behind latency, and possibly enable the design of new treatment strategies targeting them.

PRDM 12: A NEW AGENT IN PAIN

The treatment of chronic or neuropathic pain presents a real challenge for public health, as current methods are lacking, and a better understanding of the molecular mechanisms behind pain is needed if new treatment strategies are to be developed. **Eric Bellefroid's Developmental Genetics Laboratory** recently identified a new agent in the process: Prdm12, an epigenetic regulator of genetic expression in the differentiation process of nociceptors, the specialist pain-perceiving neurons. The proposed studies will seek to understand its role in nociceptor creation in mammals, and determine its role in pain-perceiving mechanisms.

PERSISTENCE: TOXIN-ANTITOXIN

Bacterial toxin-antitoxin systems play a role in persistence, a kind of tolerance to antibiotics. The hypothesis is that when these systems are activated in a small number of bacteria cells in a clonal population, they induce a dormant state in which metabolic function is greatly reduced. The dormant state then enables antibiotics and other stressful conditions to be tolerated. This makes it essential that we understand the regulating processes that govern the activation of these systems on the level of a single cell. In the project *SCA-Tox*, the **IBMM Bacterial Genetics and Physiology Laboratory** (Laurence Van Melderen) will analyse the different levels of regulation of certain toxin-antitoxin systems using the E.Coli bacterial model. Techniques used in genetic research and real-time fluorescent microscopy coupled with flow cytometry will give the researchers a better understanding of how these regulating processes act on single cells.

AMMONIA TRANSPORTER PROTEINS

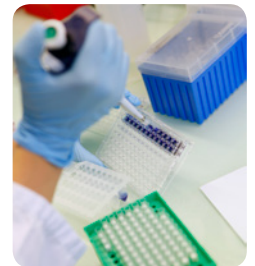
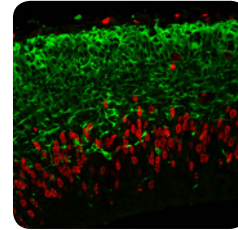
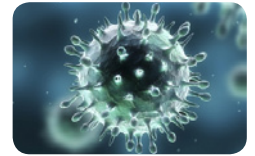
Ammonia is one of the main sources of nitrogen for microorganisms and plants, and in animals, it plays a key role in controlling acid-base homeostasis. The production of ammonia in the kidneys and its expulsion in the urine is a major process in regulating systemic pH. However, ammonia remains better known for its neurotoxicity, with the liver playing a key role in its detoxification. The PDR obtained by **Anna-Maria Marini** and the **Biology of Membrane Transport Laboratory** seeks to shed light on the pathophysiological roles of the ammonia transporter proteins Mep-Amt-Rh, as well as the mechanisms that govern their transporter activity to gain a better understanding of the function and regulation of cell membrane permeability with regard to ammonium.

INFECTION FACTORS

In natural conditions, resistance to infection varies greatly between individuals. There are a wide range of reasons for this variability (genetics, commensal bacteria, the environment, etc.), which cannot yet be predicted for a given individual. The **Parasitology Laboratory**, managed by **Eric Muraille**, found that allergic asthma caused *Brucella* bacteria in the lungs of infected mice to multiply at a greatly increased rate. This research project seeks to identify, *in vivo*, the mechanisms involved in this phenomenon. Once identified, we will have a better understanding of the individual factors that increase susceptibility to infection and be better able to develop more effective individual prophylactic and curative strategies against bacterial infection.

“ACTIVE” MEMBRANE CONFORMATION

When bound with external molecules, the cell membrane's receptors adopt an “active” conformation able to interact with factors in the cytoplasm that trigger specific cellular responses. Some membrane transporters are also able to interact with transduction factors and trigger adaptive responses. The PDR project being carried out by **Bruno André - Molecular Cell Physiology Laboratory** - in partnership with the BioModelling, Bioinformatics, and BioProcesses department (ULB Faculty of Sciences) has the aim of studying this phenomenon in the particular case of a yeast amino acid membrane transporter. The results of this study should provide valuable insight into similar mechanisms in human cells.



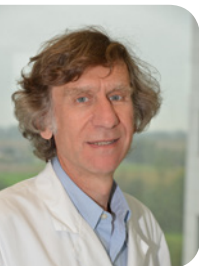
THE BLOOD-BRAIN BARRIER

Blood vessels in the brain differ from the peripheral vascular system by being impermeable to blood components. In this way, the brain stays safe by preventing the penetration of potentially harmful substances or cells. But in doing so, it also closes the door to therapeutic molecules used to treat neurological pathologies. The **Laboratory of Neurovascular Signaling**, managed by **Benoit Vanhollebeke** (who has FNRS funding for several projects), has just joined an European ITN network of 12 laboratories carrying out cutting edge research into the blood-brain barrier. Within the network, the laboratory is carrying out a comparative study of molecular signatures in the blood-brain barrier throughout evolution. Raoul Germano, a medical doctor, will lead the project.



ProsPECT: better prostate cancer diagnostics

ProsPECT, the new Biowin project, is setting out to develop new tracers targeting prostate cancer that perform better and are easier to use than current imaging agents.



Prostate cancer is currently the most frequently diagnosed cancer in men aged over 50 in Western countries. In light of this statistic, the ProsPECT project intends to improve diagnostics. It will do this by developing new fluorine-18 radiotracers that are much more effective and easier to use than current imaging agents. With both the **Center for Microscopy and Molecular Imaging (CMMI)** and the Biomedical Cyclotron/PET Unit at Erasmus Hospital working on the project, the ULB is a major contributor to the project that received Biowin certification in September 2016.

3 COMPANIES AND 4 RESEARCH LABORATORIES: COMPLEMENTARY PARTNERS

Coordinated by Trasis, the consortium also includes Xpress Biologics and Citius Engineering. The companies are making a major contribution to the project's funding, and once topped up with funding from Wallonia, the total budget stands at €5.4m. Of course, they are also bringing their experience of industrial processes to the table, and will be expanding their ranges of products and services upon completion of the project.

As for the research laboratories, Prof. Serge Goldman (CMMI and Erasme Hospital) explains that, "The consortium is built on a solid foundation of trust", in particular between the ULB and the

In Vivo Cellular and Molecular Imaging Center laboratory at John Hopkins University in the USA, which has patented the DCFPyL molecule, traced with fluorine-18, to reveal *Prostate Specific Membrane Antigen*, PSMA. 29 years ago, it was to this Baltimore University that Serge Goldman travelled for training in PET-Scans: he had already been working with Prof. Robert Dannals, the radiochemist who has recently developed DCFPyL. The same is true of the longstanding relationship between the ULB and KUL's Radiopharmaceutical laboratory where Prof. Guy Bormans has developed and patented a fluorine-18 tracing method that is perfectly suited to the peptides used to reveal PSMA.

Together, the partners boast complementary expertise in medical imaging, chemistry, methodology for biomedical science experiments, market knowledge, and radiopharmaceutical engineering, design, and production, making them more than ready to rise to the challenges of the ProsPECT project.

More specifically, within the consortium the CMMI will carry out *in vivo* tests in the preclinical phase to generate comparative effectiveness data, and shed light on the characteristics of the fluorine-18 radiotracer. Then the Biomedical PET/ Cyclotron Unit will oversee the phase 1 clinical trials to test the new molecules on patients and compare their properties with molecules that are already approved for human use.

"The advantage of working with these specific molecules like PSMA peptides is that we can move on from diagnostics to treatment," Serge Goldman explains. The project partners are already looking at the research and development in targeted isotope treatments they will be able to undertake in the future, based on the molecules developed as part of the ProsPECT project.

Sibylle Rocher-Barrat

MOLECULAR IMAGING AND TRACERS: A BRIEF EXPLANATION

In cancerology, molecular imaging is used to locate and view cells and how well they are working *in vivo*. Positron Emission Tomography, or PET-Scans, observes an isotope (a substance with low radioactivity) that is injected into the human body, and which collects around tumours and/or metastases, assisting diagnosis. For most cancers a tracer like FDG, a glucose derivative, is used, but it does not generally gather around prostate cancer. The *Prostate Specific Membrane Antigene* (PSMA), on the other hand, is a protein that is characteristic of prostate cancer. PSMA PET tracers have already been developed, but within ProsPECT there is a desire to develop better ones which are as effective as the fluorine-18 radioactive isotope, the most effective and easiest to use.

CliniX: a brand new partnership for cutting edge training



Biopark Training and the ULB's Health Cluster's continuing education centre are joining forces to become HeLSci (ULB Continuing Education – Health & Life Sciences). Their first project? The Clinical Research Professional (CliniX) course.



HeLSci (for ULB Continuing Education – Health & Life Sciences) is where two training centres come together, pooling their strengths under a single roof.

In the words of Arnaud Termonia, Director of Biopark Training and the ULB's Continuing Education Department, “Biopark Training and the ULB's healthcare training centre deliver training programmes that are absolutely complementary”. “One is an expert in life sciences, the other in health sciences, and so many projects lie somewhere between these two fields”, interjects Xavier Pesesse, Manager of the Healthcare Training Centre on the Erasme Campus. “It therefore seemed natural that in an effort to boost our visibility and expand our reach,

we should pool our courses, teaching staff, ideas, and funding”, Arnaud Termonia reveals.

CLINIX: CLINICAL RESEARCH PROFESSIONAL

And the partnership is already signed and operational: proof can be seen in the CliniX (Clinical Research Professional) course which started in October. The course was developed on the back of the ULB's 20+ years of experience in the field, as well as the unprecedented partnership with HeLSci, Forem, Bruxelles Formation, and Altran. “The new course for professional researchers is delivered on the Erasme campus”, Xavier Pesesse explains. “The aim is to give the students the skills they need to enter clinical research, a sector that is constantly evolving and regularly recruiting experts. Belgium's excellence in the field is internationally recognised, but the bodies that carry out this kind of research have difficulty finding a sufficient number of properly trained applicants. We want to fill this skills shortage”.

The course is made up of a two-month theory module, delivered exclusively in English, followed by a two-month work placement. It should enable the attendees (12 jobseekers from Brussels and 12 jobseekers from Wallonia) to acquire the skills they need to work in clinical research, and in critical roles in particular

(regulatory affairs, clinical trials, quality control and assurance, pharmacovigilance, etc.).

“Through this ambitious project, HeLSci is playing an active role in the socioeconomic development of both regions (Brussels and Wallonia), within a flourishing ecosystem that is home to academic and industrial expertise and cutting edge training”, Arnaud Termonia concludes.

Damiano Di Stazio





Caprion: a new player on the Biopark

ImmuneHealth has just sold its immunomonitoring laboratory to the Canadian company, Caprion Biosciences, who will now run part of its business from Belgium.



“We have been working on acquiring a European site for some time now, and we are delighted to have completed the acquisition of ImmuneHealth”, reports Patrick Tremblay, Vice-President of the Canadian company, Caprion Biosciences. “We looked at a selection of opportunities in Europe and found that the Biopark offered a range of advantages: a stimulating environment and enthusiastic contacts, regional development policies that facilitate funding for research, and the opportunity to work with both public and private partners. In particular, the Biopark is ideally placed for us to offer local services to our biopharmaceuticals customers, whose development departments are found not only in North America, but also in Europe: a significant advantage for delivering a better service to our customers”.

A WIN-WIN TRANSACTION

However, despite being sold, ImmuneHealth will retain the same laboratory team, do the same work on the same projects, and still be based in Charleroi. Thanks to the sale, ImmuneHealth will be able to refocus on providing human biological samples through its clinical unit.

“Caprion’s vision and expertise will enable the services developed by ImmuneHealth to be rolled out on a larger scale. This will in turn forge closer bonds between Canada and Wallonia and promote solid partnerships”, Dominique Demonté, Director of the Biopark, explains. “The acquisition is great news for ImmuneHealth’s customers, as well as for our regional development: Caprion is a major player in immunology, which is also one of the Biopark’s main areas of expertise”.

Patrick Tremblay goes on to say that, “The services that ImmuneHealth’s immunomonitoring laboratory offers its customers in vaccinology and infectious diseases will consolidate Caprion’s range of products and services, which focuses mainly on immuno-oncology”.

INTERESTING PROSPECTS

The prospects for growth are very real, as they are for job creation. “We believe that we will be able to expand the team currently working

on the Biopark”, Patrick Tremblay reveals. “We have enough space to double the workforce within the next few years. The team has already been growing since mid-2016, and we want to roll out services for international studies that we think we can launch from our Biopark branch as early as next year”.

In Canada, Caprion has been working to develop close partnerships with local stakeholders and the research sector for a few years now. In the past four years, Caprion has founded the *Personalized Medicine Partnership for Cancer* (notable partners include Pfizer, Sanofi, and Q-CROC), and the company intends to get involved in similar networks in Belgium, too. “Two of our staff from Montreal are already in Belgium helping us to manage business between the two sites”, Patrick Tremblay continues. “One of our priorities is to establish our life sciences network across Belgium and Europe. We have already discussed this with the Institute for Medical Immunology (IMI), local businesses, and various public bodies in Belgium”.

Damiano Di Stazio

CAPRION BIOSCIENCES IN A NUTSHELL

Founded in Canada (Montreal) in 2000, Caprion works to identify biomarkers and proteomic targets. Caprion is one of the main providers of proteomic and immunomonitoring services to the pharmaceutical and biotechnology industries.

It develops its own *in vitro* diagnostic products targeting cancer, metabolic disorders, and infectious diseases. Caprion now has two offices in North America and Europe, and employs 120 staff, of which 70 have PhDs or master's degrees.

Its ambition? To meet the immunomonitoring needs of its biopharmaceutical partners around the world.



Brigitte Genard (CEO, ImmuneHealth) and Dominique Demonté (Director, Biopark) hand over the keys to the immunomonitoring lab to Benoit Houle (CEO, Caprion Biosciences Belgium).

IMMUNEHEALTH WILL CONTINUE ITS CLINICAL ACTIVITIES

Founded in 2007, ImmuneHealth specialises in supplying human biological samples for use in research and development and the design and development of immunological trials.

The highlight of recent years has been a strong positioning in analytical services supporting biotechnology and pharmaceutical companies in the development of new vaccines and immunotherapy treatments. ImmuneHealth's main role is now to hold on to the work of its clinical unit, located in the CHU Tivoli hospital in La Louvière.

An expert in carrying out prospective studies providing biological samples, the clinical unit has built a solid network with most of the hospitals in the *Fédération Wallonie-Bruxelles*.



I-Tech Incubator 3 on the horizon?

Having supported 120 projects over the past six years, the I-Tech Incubator is proud to see that the Biopark is now home to 35 companies and 1200 jobs. But the result of this success is that there is no room at the I-Tech Incubator! We find out the current state of play with Marie Bouillez, the I-Tech Incubator's director.



“We are hoping that two new companies will emerge from the incubator by the end of the year”, Marie Bouillez explains. “At the moment, we are nurturing around 20 life sciences and engineering science projects, 30% of which are from ULB laboratories, and the other 70% from project commissioners drawn to our ecosystem”. Since 2010, I-Tech Incubator has helped 12 companies to see the light of day, generating 140 jobs and raising €25m of funding.

To accommodate growing demand, I-Tech Incubator is working with IGRETEC to renovate the Clément Ader buildings with a view to housing the I-Tech Incubator 3 which should open its doors in 2019 with a capacity of 4000m². While sourcing funding and waiting for the construction work to be completed, other avenues are being explored with IGRETEC so that the Biopark can accommodate more companies. In parallel, “We want to give fresh impetus to the business network and deepen interaction between the companies present on the Biopark”, Marie Bouillez confirms. And it is with this in mind that I-Tech Incubator is recruiting a new General Manager.

Sibylle Rocher-Barrat

ANTIGON, A NEW SPIN-OFF ON THE BIOPARK

Nurtured in the I-Tech Incubator for two years, Antigon has recently moved in to I-Tech Incubator 2, while still in its infancy. Antigon is working to create safer transfusions using patented technology developed by Dr Corazza Francis and Dr Hanane El Kenz. Emerging from the Translational Research Laboratory (Faculty of Medicine, CHU Brugmann), Antigon will develop an easy-to-use *Point of Care Testing System* for use all over the world. The product will enable healthcare practitioners to verify the match between a patient's ABO blood group and the blood bag they will be receiving with 100% reliability. Antigon won a call for projects from the Mecatech Cluster and was awarded, upon its inception, funding worth €1.7 in subsidies from the Walloon government and venture capital from Theodorus II, Invest Sambrinvest, and several beangel investors.

DIGITAL ATTRAXION SUPPORTING DIGITAL PROJECTS

Founded in July 2016, DIGITAL ATTRAXION is a digital start-up accelerator for the new economy that has just opened for business in Hainaut. More specifically, its role is to support start-ups in their first round of fundraising through coaching from carefully selected experts who can, amongst other things, offer assistance in structuring their business model. This initiative forms part of the desire to breathe a new lease of life into the Walloon digital sector.

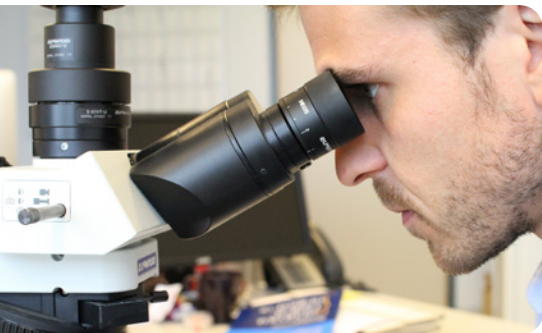
The I-Tech Incubator chose to invest in DIGITAL ATTRAXION as it seeks to become more closely involved with the digital sector, and e-health in particular.



OncoDNA: more resources in the fight against cancer



The recent fundraising round that generated almost €8m should enable the Walloon gem to give its marketing a boost and expand its international reach.



Four years after it was founded there is no doubt that OncoDNA, the company that analyses tumour DNA, has the wind in its sails. The Gosselies-based company has just completed a - private - fundraising round worth €7.7m.

“The funding received from the Ackermans & van Haaren holding will help us to expand more quickly”, states Jean-Pol Detiffe, CEO of OncoDNA. “The aim is to develop a worldwide reach and to demonstrate the benefits and utility of our work”.

More than 10,000 people from the four corners of the globe (60 countries in all) have registered on OncoShare, the app developed by the company that forms a bridge between patients, oncologists, and OncoDNA. But the CEO fully intends to ride the momentum.

“Feedback from oncologists and other specialist doctors has been very positive”, Jean-Pol Detiffe goes on, “So we want to take this vision of precision medicine even further to meet the

needs of our patients, who are asking for us increasingly frequently”.

EVER CLOSER TO OUR PATIENTS

In a world where computers are ubiquitous, more and more cancer patients are seeking out information for themselves. “And they really know what they’re talking about”, Jean-Pol Detiffe emphasises, before going on: “This has meant we have had to adapt to meet some very specific requests, more than 90% of which come from abroad. This makes it important that we are able to clearly explain the advantages of precision treatments for cancer, in particular the benefits afforded by full molecular analysis of the tumour and the use of liquid biopsies to monitor blood levels. We therefore have to find multilingual staff who can explain our services to patients and doctors all over the world”.

A patient support team is also being formed: “The team will be in direct and indirect (on social media, for example) contact with patients. This requires particular skills and expertise” (See box).

“Our future challenges are just as exciting: we also want to work more closely with expert sequencing labs and make our interpretation systems available to them to develop more powerful solutions”.

Damiano Di Stazio



LEARNING THE BASICS OF ONCOLOGY

This course is also an important component in OncoDNA's strategy. The biotech company is working with the ULB training centre, HeLSci (ULB Continuing Education – Life Sciences & Health) to train its patient support team in the fundamentals of oncology.

“This also requires a great capacity for communication. It's all covered in the training programme”, concludes Jean-Pol Detiffe.

Courses now include *digital learning*



The ULB Podcast team (Academic Support Department) and HeLSci (ULB Continuing Education - Health & Life Sciences) have recently put together an e-learning course covering the fundamentals of immunology: Immunokit.

A few months ago Olivier Michel, the Academic Manager of the Certificate in Clinical Immunology at the ULB, contacted the HeLSci training centre (ULB Continuing Education - Health & Life Sciences) to discuss delivering some of his course in a digital format.

"The certificate is awarded for completion of a course spread over two years, intended for specialist doctors", specifies Erika Baus, the project's scientific coordinator, "The course includes a foundation module, Immunokit, that we have developed in a digital learning format, in partnership with Olivier Michel, Oberdan Leo, and ULB Podcast".

From this year onwards, those studying towards the Certificate in Clinical Immunology will be able to study the unit on immunology fundamentals online, thanks to Immunokit.

"In addition to offering students more flexible learning, digital learning also brings advantages from the teaching methods standpoint", explains Nicolas Roland, manager of ULB Podcast. "E-learning is an opportunity for teaching staff to update their classes with interactive components and deliver a more engaging presentation of

the course content. Students can also reuse or refresh skills normally acquired for use in the classroom to answer more specific questions, such as case studies".

A PRACTICAL, FLEXIBLE TOOL

"The module's objective is to provide a highly structured and targeted presentation of key concepts in immunology, using illustrations that gradually take shape", Erika Baus goes on. "The kit is flexible and easy to use: in addition to videos for each chapter, class notes and summary tools have been incorporated into Immunokit".

And that's not all. "We also intend to develop other courses radiating out from this foundational module: in the future, kits will be developed around themes in vaccinology or cancer immunotherapy, for example".

"*Digital learning* is the future of training", Nicolas Roland adds, "It is not intended to replace classroom-based learning, but to complement it and improve the quality of learning".

Damiano Di Stazio

USER-DRIVEN CONTINUOUS IMPROVEMENT

"Participants will play a key role in improving the course", Erika Baus stresses.

"The kit won't be perfect from the very beginning", Nicolas Roland picks up, "We need to collect student feedback and needs: the kit is made, evaluated by students, improved, re-evaluated, and so it goes on. That's why continuous assessment is so important".

