Unleashing the body’s own immune system to cure cancer
p2

A flagship building for cancer research in Western Switzerland
p3

Biopôle Lausanne: the campus where immunology scales up
p5

In Western Switzerland immunotherapy is providing the leverage for a massive scaling-up in life sciences
p9

Immunotherapy is the revolution we were hoping for in the fight against cancer
p15

A booming economy supported by an innovative life science sector
p18
Unleashing the body’s own immune system to cure cancer

When the 2018 Nobel Prize in Physiology or Medicine was presented to James Allison of the University of Texas MD Anderson Cancer Center in Houston and Tasuku Honjo of Kyoto University in Japan, it was not only a reward for research that has given cancer patients hope for the future. It was also recognition of therapies that are already curing many of them.

In Western Switzerland, the extraordinary potential of immunotherapies has been embraced enthusiastically by researchers, clinicians, academia and companies. It has triggered all kinds of initiatives gathering forces from academia, pharma and biotech in the Lake Geneva region. After the creation of a Tumour board, where researchers share information with oncologists from the whole region, the Swiss Cancer Centre Leman brings together more than 80 research groups.

This led to Agora, a new centre at the CHUV where partners such as the ISREC Foundation, the CHUV, the University of Lausanne, the Swiss Institute of Technology of Lausanne (EPFL), the Ludwig Institute for Cancer Research, the University Hospital of Geneva (HUG) and the University of Geneva gather together 300 researchers and clinicians to develop and apply new cancer therapies under one roof. With about 10,000 new cases of cancer every year in Western Switzerland, this gathering of forces has allowed the region to reach a critical mass for establishing a comprehensive cancer centre as recommended by the US National Institute of Cancer.

For patients, it means the possibility of benefiting faster through novel cancer therapies including during the early phases of clinical trials when all other treatments have failed. For pharma and biotech, it also means better access to cutting edge novel treatments such as T-cell therapies. This has already attracted major pharma such as Roche and Bristol Myers Squibb to the region, and more recently Incyte (see page 26) which is building a new facility to produce immunotherapies.

They add to the efforts by both established local players including Debiopharm and Merck as well as start-ups such as Amal Therapeutics (see p.47) and ADC Therapeutics (see p.22) which has raised 445 million francs, making it the second unicorn (a startup valued at more than a billion dollars) to be based in French-speaking Switzerland after neurorehabilitation specialists MindMaze.

That is not to say that immunotherapy is the long expected magic bullet against cancer. The Nobel Prize-awarded checkpoint immunotherapies still only work for a limited number of patients. Activating the immune system may also trigger autoimmune side effects. So there is still a great deal of research to be done, if only to make such therapies more accessible, including in terms of pricing.

That is where the cluster effect of the Health Valley of Western Switzerland plays a major role. As readers will discover in this issue of Technology by Bilan the region is home to many institutions and companies which are translating research from the labs to the patient’s bedside in various fields beyond cancer.

From enabling technologies such as Genomsoft’s compression technologies for genetic data (see p.8) to new treatments for inflammatory diseases (see p.28), medical and pharma research is thriving from Geneva to Bern. The region’s knowhow in microtechnologies is also fertile soil for innovation in medtech as illustrated by companies such as aktiba (see p.42) and Sav-Iol (see p.45). And with new or expanding infrastructures such as the Marly Innovation Center (see p.39), the Biopôle (see p.14) and BioArk (see p.48), there is more to come.

We hope you will enjoy the many promising discoveries and innovations presented in this issue of Technology by Bilan. Not least because beyond the many opportunities they offer for business, they are already offering effective therapies for millions of patients worldwide.

FABRICE DELAYE
Editor of Technology by Bilan
A flagship building for cancer research in Western Switzerland

Initiated by the ISREC Foundation in 2013, AGORA is the result of a partnership between the University Hospital of Canton of Vaud (CHUV), the University of Lausanne, the Swiss Federal School of Technology in Lausanne (EPFL), the Ludwig Institute for Cancer Research, the University Hospitals of Geneva and the University of Geneva. Built in 33 months, between October 2015 and June 2018, the AGORA cluster will bring together nearly 300 scientists and clinicians. Most of these specialists in cancer research come from the partner institutions. Physicians, biologists, geneticists, immunologists, bioinformaticians and bioengineers will work together to take on the many challenges posed by this disease, in order to develop and implement novel therapeutic options for cancer patients.

Created by the architectural firm Behnisch Architekten, the AGORA building offers 11’500 m2 of laboratories, technology platforms, offices, conference rooms, a large auditorium and a restaurant. The architecture of the building fosters interactions between disciplines, among researchers, and between established scientists and students. AGORA will also contribute to the community at large and play an important role in helping patients. Communal spaces such as an atrium near the entrance of the building will enable scientists and clinicians to explain treatment processes and the value of ongoing research to the public.
Genre de média: Médias imprimés
Type de média: Magazines spéc. et de loisir
Tirage: 9'283
Parution: annuelle
Page: 6
Surface: 105'742 mm²
Ordre: 1084202
N° de thème: 531.027
Référence: 71435291
Coupure Page: 2/2
Biopôle Lausanne: the campus where immunology scales up

A glimpse behind the community model that enables company development and inter-organisational collaboration and innovation.

BY NASRI NAHAS, CEO BIOPÔLE SA

Shaping new products, designing new efficient immunotherapies, introducing nutritional goods to cancer research... these are just a few of the inspiring business projects that visitors will find at Biopôle Lausanne. They all attempt to foster research in life sciences and quickly turn it into solutions for patients.

At Biopôle Lausanne, life sciences companies and academic institutions cover, among other things, the vast field of immunology, with an emphasis on vaccines, antibodies, cell therapies and immune modulators. Leading companies include ADC Therapeutics, Novigenix, Anergis, Mymetics, Gnubiotics and Abionic (see box). Though immuno-oncology represents one of the most important research fields at Biopôle, our community members’ expertise spans an impressive number of therapeutic areas, fostering increased exchange and cross-fertilisation of ideas.

Further, our corporate and academic members are increasingly aware of the need to act as a community to make a difference. Not only do they share costs including access to core facilities, technology platforms and discounted service offers, but, in particular, they also actively build synergies and long-lasting partnerships.

Multi-discipline to serve innovation

Thanks to the presence of leading research institutes, a lively life sciences industry and a growing portfolio of start-ups, the Health Valley and particularly the Canton of Vaud are a playground for life sciences. Biopôle is at the epicentre of this dynamic region and mirrors the diversity of its stakeholders. Additionally, the campus fosters inter-organisational collaboration that encourages members to learn from each other and come up with novel out-of-the-box solutions. The more pairs of eyes you have looking at a problem, the better the chances of a solution. Because of this community model, whose strength lies in the network, companies can not only develop common business and research projects but, most importantly, can seamlessly liaise to share key learnings and insights.

Access to potential business and research partners

One of the most important features when getting established on campus and becoming a member of the Biopôle community is the access to the privileged network of industry and academic members of the community.

"Lausanne is the vibrant and growing place to be for innovation in life sciences"

This is easy because of the proximity on site and participation in a variety of networking events organised to help the community stay in touch. We like to think of our role at Biopôle as the enablers of these exchanges and we put a lot of effort into constantly developing additional networking venues, programmes...
and events to share and challenge research and business insights.

In 2018, two Biopôle companies in the field of immunology, Mymetics Corporation and Anergis, entered into a research collaboration project. The pre-clinical study programme, planned to last until the end of 2019, will evaluate the immunogenicity profile of the Anergis peptides which are designed to treat birch allergy when presented on Mymetics’ proprietary virosomes, and will compare the results to Anergis’ AllerT product combination. This collaboration perfectly illustrates the community spirit present at Biopôle Lausanne.

In addition, we are especially proud to host leading academic institutes and research groups including the Department of Oncology of the University Hospital of Canton Vaud (CHUV), the Centre of Infection and Immunity (CIEL) of the University of Lausanne and the Ludwig Institute for Cancer Research. In addition, we are near the CHUV medical centre, the Swiss Cancer Centre Léman and the Swiss Federal Institute of Technology (EPFL). The presence of the research laboratories of the Faculty of Biology and Medicine of the University of Lausanne provides opportunities for community members to work near academic and clinical folks, their discoveries and their research platforms.

**Start-ups have a place to experiment and grow**

The Swiss Biotech Report 2018 states that while Basel maintains its position as leader for big established pharmaceutical companies, Lausanne is “the” vibrant and growing place to be for innovation in life sciences. This is due, among other things, to a high concentration of start-ups, a unique educational offer in the region, second-to-none infrastructure invested in by the Canton of Vaud and a plethora of supporting institutions and partners. In Switzerland, a serious life sciences company can reasonably raise up to 1 million CHF in seed funding. Yet we are aware of the high level of investment needed to build a laboratory and how discouraging this can be for entrepreneurs who are then often left with the option of staying in their academic laboratories instead of developing their ideas in entrepreneurial set-ups. To create a comprehensive offer to life sciences companies in the Canton of Vaud, Biopôle decided to close the loop and introduce Startlab, an incubator exclusively dedicated to life sciences. How does it differ from the others? Startlab is based on a flexible pay-as-you-play model where all the initial investments have been taken over by Biopôle, thus transforming the majority of our incubated start-ups’ fixed costs into variable costs. Start-ups are thus enabled to better allocate their resources and grow in a thriving and inspiring life sciences ecosystem. Meanwhile investors are reassured that the entrepreneurs are not only coached and accompanied by seasoned entrepreneurs, but can grow and experiment in a safe context while focusing purely on their own business and research.

The incubator is physically located at the centre of the Biopôle Campus and allows full integration of the entrepreneurs into the Biopôle community.

**Digital is the new black**

After several years attending conferences on the consequences of the digital revolution, it was time to act and create a hub where digitalisation in life sciences can shape future developments. The Biopôle Digital Health Hub gathers together innovative companies that integrate digital technologies into the life sciences sector. With different sectors of operations, it represents a reference for digital integration for the community and a leading think tank to raise awareness in the digital health field. For example, immunology-oriented companies can profit from the experience of the companies working at the Digital Health Hub to fully integrate digital products into their research, patient centricity and business models.
Aerial view of Biopôle Lausanne, the growing urban life sciences campus overlooking lake Geneva.
HOW SOME COMPANIES AT BIOPÔLE LAUSANNE COVER DIFFERENT IMMUNOLOGY AREAS

<table>
<thead>
<tr>
<th>COMPANIES</th>
<th>ADC THERAPEUTICS</th>
<th>Anergis</th>
<th>Glenmark</th>
<th>GNUBIOTICS</th>
<th>MYMETICS</th>
<th>Novigenix</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABIONIC</td>
<td>Develops a technology that uses the properties of adsorbed immunoglobulins to specifically recognize biomarkers present in a drop of blood in a nanofluidic setting.</td>
<td>Therapeutics</td>
<td>Therapeutics</td>
<td>Technology it is possible to detect early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GLENMARK</td>
<td>Develops bispecific antibodies that help immune cells to get in contact with cancer cells to better fight them.</td>
<td>Therapeutics</td>
<td>Therapeutics</td>
<td>Technology it is possible to detect early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GNUBIOTICS</td>
<td>Uses modified viral shells to stimulate the immune system without triggering early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td>Therapeutics</td>
<td>Therapeutics</td>
<td>Technology it is possible to detect early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MYMETICS</td>
<td>Uses modified viral shells to stimulate the immune system without triggering early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td>Therapeutics</td>
<td>Therapeutics</td>
<td>Technology it is possible to detect early phases of colorectal cancer by recognizing a specific gene activation signature of immune cells present in the blood.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IMMUNOLOGY AREA

Diagnostics: Therapeutics, Therapeutics, Therapeutics, Therapeutics, Therapeutics, Diagnostics

FOCUS

Allergies/sepsis: Oncology, Allegies, Oncology, Nutrition, Vaccines, Oncology
In Western Switzerland immunotherapy is providing the leverage for a massive scaling-up in life sciences

Immunotherapy, which trains T-cells in the body to detect and kill cancer cells, is a growing field in which academic institutions and biotech-pharma companies in Western Switzerland are fast converging. It is creating a forward-looking hub in oncology and beyond.

BY FABRICE DELAYE
Bioreactors used for the production of Merck’s immuno-oncology compounds in Vevey.
On October 3rd 2018, a futuristic new building, the Agora, became home to 300 researchers and clinicians in 25 different specialties. Their objective: to discover and accelerate the transition of novel oncology treatments from labs to patients.

Located at the heart of the Lausanne University Hospital (CHUV) campus, Agora brings together multi-disciplinary teams of doctors, biologists, immunologists, bioinformaticians and bioengineers from the different partner institutions: the Swiss Institute for Experimental Cancer Research (ISREC), the University of Lausanne (UNIL), the Swiss Federal School of Technology (EPFL), the Lausanne University Hospital (CHUV), the University Hospital of Geneva (HUG), the University of Geneva (UNIGE) and the Ludwig Institute for Cancer Research Lausanne.

The microenvironment of Professor Coukos

Immunotherapies, both at research and clinical levels, have been instrumental in creating this new facility - which is the flagship of a network of academic institutions, pharma and biotech in the domain of immuno-oncology: It is creating the critical mass for the region to become a world class hub in the fight against cancer.

Professor George Coukos, who is both the head of oncology at CHUV and director of the Ludwig Institute for Cancer Research in Lausanne, explains: “For research and therapies that were predominant until 10 years ago, cancer was seen as the result of genetic alterations and the tumour cells themselves as privileged targets. It drove chemotherapies and later targeted therapies. But we came to realise that these approaches were largely not curative but palliative.”

In other words, these therapies were playing a major role in slowing tumour growth, but cancers were finding ways to overcome this suppression. Cancer research then started to make important progress towards understanding how the disease works and what could provide important leverageto gain therapeutic momentum.

“We came to realise that, in fact, there are all kinds of mechanisms that support the survival and growth of tumour cells”, says Coukos. “One of the major breakthroughs has been the understanding of the role of the tumour microenvironment.”

This microenvironment is made of the body’s own cells that naturally populate tumours, like those from the immune system, the vascular system or the stroma, the connective tissues that support the tumour. That is because the tumour and its surrounding microenvironment interact constantly.

“Central to this,” explains Coukos, “is the fact that the tumour cells co-opt other cells and ‘hack’ them to change their functions for their own advantage.”

Hacking the immune system

The first therapies to reach clinic from that holistic new logic are immunotherapies or treatments that solicit certain parts of a patient’s immune system to fight the cancer.
SWISS START-UPS BUILD LEADERSHIP IN PERSONALISED IMMUNOTHERAPIES

Intercepting colon cancer in its earliest stages and years before the appearance of symptoms could help eradicate the disease. From its offices at the Biopole in Lausanne, Novigenix is developing non-invasive blood tests for early detection of cancer in collaboration with hospitals and clinics in Switzerland. Its technology platform combines blood transcriptomics with advanced data analysis using machine learning and artificial intelligence to decrypt specific patterns of immune system reaction to the onset of disease. Changes in the expression profile of circulating immune cells that are exposed to tumours can be measured in blood and interpreted as early indicators of cancer. The first-generation test ColoX for detection of colorectal cancer is currently available in Switzerland and a second generation is being developed for global roll-out. Novigenix is also exploring other applications of its technology platform such as patient stratification and monitoring of immunotherapies.

In search of cancer markers

Lunaphore is a Swiss-based spin-off of the EPFL developing tissue staining devices for cancer diagnostics. It is recognized as one of the most innovative companies nationally and internationally. Immunostainings are widely used biomarker tests which reveal presence of relevant cancer markers through coloration of tissue samples. Nowadays, techniques called multiplexing, allow testing several markers on the same sample to get a full understanding of how immune cells interact together against cancer. Immunophenotyping is key to understand each case and offer patients personalised therapies. Lunaphore is developing a technology based on a microfluidic chip which aims to perform those tests much faster and with higher precision than standard techniques. Ultra-rapid multiplexing may enable same-day patient cases, with better outcomes. With its first product to be launched in the upcoming months, Lunaphore’s vision is to bring cutting-edge solutions to the tissue cancer diagnostics field. (FD)

With biologicals such as man-made proteins, immunotherapies stimulate the immune system to work harder or smarter to attack cancer cells. One of the main reasons cancer cells thrive unchecked is that they are able to hide from the immune system. So, certain immunotherapies mark cancer cells to make it easier for the immune system to find and destroy them. Others boost the immune system to work better against the cancer. In all cases, they help the body to heal itself.

Today there are several types of immunotherapies used to treat cancer. Checkpoint inhibitors work by releasing the brakes that keep T-cells – a type of white blood cell – from killing cancer cells. Adoptive cell transfer is a treatment that attempts to boost the T-cells’ natural ability to fight cancer. Finally, monoclonal antibodies are immune system proteins created in lab. With targeted therapies they are designed to attach to specific targets found on cancer cells and stop them growing. But some monoclonal antibodies also mark cancer cells so that they will be more easily seen and destroyed by the immune system.

While at the University of Pennsylvania in the early 2000s, George Coukos’s laboratory was among the first to demonstrate that the immune system plays a key role in the growth of tumours. At the time, the first approaches to immunotherapy were vaccines. “It did not go far because these vaccines were too soft weapons,” he explains. “They take time to work and did not provoke strong immune responses, so tumours had time to adapt. We changed our approach but not the goal to mobilise the immune system.”

Immune checkpoint therapies

The failure of the first cancer vaccines fuelled more research into understanding how to activate spontaneous immune responses in the tumour microenvironment. To avoid autoimmune diseases, the immune system has some mechanisms that weaken
Monoclonal antibody, Avemulab is approved since March 2017 for Merkel-cell carcinoma.

or suppress the power of the immune response. This is one of the mechanisms tumours hacked to become invisible to the immune system. American immunologist James Allison then discovered that such a mechanism can be overcome.

Specifically, the antibody blockade of a T-cell inhibitory molecule, known as CTLA-4, could lead to enhanced anti-tumour immune responses. This laid the foundation for the development of other drugs that target T-cell inhibitory pathways, labelled “immune checkpoint therapies”. The discovery of the CTLA-4 inhibitory mechanism itself led to the clinical development by Medarex of the drug Ipilimumab, acquired in 2009 by Bristol Myers Squibb. The drug was approved in 2011 by the FDA for the treatment of metastatic melanoma and has since demonstrated remarkable results (see the interview with Professor Michelin, page 24).
The success of antibodies developed against CTLA-4 proved the strength of this approach”, Coukos says. Soon, a second wave of immune checkpoint therapies was approved against other types of cancer. Known as PD-1 (programmed cell death-1, a receptor expressed on the surface of the activated T-cell) and PD-L1 (its ligands commonly expressed on the surface of dendritic cells or macrophages), these immune checkpoint proteins became biomarkers for new immunotherapies.

Nivolumab (an anti-PD-1 drug developed by Bristol-Myers Squibb) was approved by the FDA in 2014 (first for previously treated metastatic melanoma and squamous non-small cell lung cancer) while Pembrolizumab, developed by Merck, was approved for previously treated metastatic melanoma. Similar strategies have been explored targeting PD-L1 to treat other cancer types including renal cell carcinoma and bladder cancer by AstraZeneca (MEDI4736) and Roche (Atezolizumab).

Not a straightforward road

BMS’s Nivolumab is already a blockbuster, but it is hard to predict whether other checkpoint therapies will be as efficient as they have been, first for melanoma and then lung cancers. “There is a long list of targets”, explains Coukos. “How successful will they be? We don’t know yet.” That is because the field has also experienced setbacks. For example, a trial with a combination of anti-CDLA-4 and anti-PD-1 by BMS, as well as a clinical trial led by Incyte to block another target (an enzyme called indoleamine dioxygenase or IDO) to increase the efficiency of checkpoint inhibitors showed negative results last year. “It was the realisation that the road will not be as straightforward as expected”, says Coukos.

Far from discouraging researchers, though, these setbacks have triggered all kinds of initiatives to improve immunotherapies. For example, Lausanne-based pharma Debiopharm is developing various approaches to enhancing anti-tumour immune response. “Cancer immunotherapy has significantly improved the survival rate for certain cancer types such as melanoma and lung cancer,” explains Thierry Mauvernay, president of Debiopharm Group. “However, the proportion of patients who respond to this type of treatment is still low, between 20% and 50%.”
Immunotherapy is the revolution we were hoping for in the fight against cancer

Olivier Michielin, chief medical officer of the division of personalised analytical oncology at the University Hospital in Lausanne (CHUV) and chief of melanoma consultation, represents a generation of doctors with one foot in research and the other in the clinic. He explained why immunotherapies are such a breakthrough in helping to defeat cancer.

BY FABRICE DELAYE

Located in the heart of the Canton of Vaud University Hospital Centre (CHUV), the Agora Cancer Centre, inaugurated in October, is at the cutting edge of cancer research in the Lake Geneva region.

The fruit of a partnership between the ISREC Foundation (the project leader) and the CHUV, the University of Lausanne, the Swiss Institute of Technology of Lausanne (EPFL), the Ludwig Institute for Cancer Research, the University Hospital of Geneva (HUG) and the University of Geneva, Agora is a concrete example of translational medicine at its best. The vision is to relate laboratory discoveries directly to their medical applications with patients. To do that, Agora has brought more than 300 practicing physicians, life scientists, medical imaging technologists and data
analysts together under one roof.

Immunotherapies, increasingly the weapon of choice in the fight against cancer, will be at the heart of Agora. As chief medical officer of the division of personalised analytical oncology and chief of melanoma consultation, Professor Olivier Michielin explains why and how these therapies are revolutionising cancer therapies.

After radiotherapy, chemotherapy and targeted therapies, the focus is now on immunotherapies. Why?

This is the revolution we hoped to see. The clinical results are so spectacular for some pathologies that for a small number of patients we no longer measure survival in months but in years. There is even the possibility that some can be cured, though it is too early to say that with any certainty.

More and more immunotherapies are becoming front line treatments. In clinical practice, oncologists essentially use immunotherapies for malignancies as well as other diseases, immunotherapies are becoming the first treatment. We can already see their incredible long-term benefits in melanoma. Some patients have stabilised for five or even 10 years. And maybe they will never relapse. These are results I would never have expected to see a few years ago.

Yet immunotherapies are not yet used as front line therapies by oncologists...

It is changing. In the case of melanoma and more and more lung cancers as well as other diseases, immunotherapies are becoming the first treatment. We can already see their incredible long-term benefits in melanoma. Some patients have stabilised for five or even 10 years. And maybe they will never relapse. These are results I would never have expected to see a few years ago.

What explains this efficiency and sustainability?

There are several reasons. The simplest is that when you do chemotherapy or targeted therapy you have a drug that targets the tumour cells. But a few days after the treatment, there is nothing. With immunotherapies, you stimulate white blood cells that have the capacity to divide and regenerate and which, moreover, have a memory. The treatment will immunise you against your cancer much in the same way that you are immune to a flu that you have already had.

Why can’t the immune system prevent these cancers from developing?

That is what it does normally. But through mutations, tumour cells manage to make themselves invisible to T cells. It is one of the main ways cancer evades the immune system. It is done by various means, for example by expressing small “antennas” on tumour cells that are normally found in certain healthy tissues. Normally these “antennas” are intended to prevent an attack by the immune system on certain cells. Cancer is kind of hacking these biological mechanisms for its advantage, to evade the immune defences. The discovery of this piracy of biology has led to the discovery of specific molecular targets, proteins like PD-1 (programmed cell death protein 1) that can be antagonised with specific antibodies. With this approach, the immune system recovers its ability to attack mutated cancer cells and destroy them.

Is it necessary to reintroduce these antibodies regularly?

Not in most cases. It is the beauty of these therapies: these antibodies allow the immune system to reprogramme itself. The T cells resume their functions and kill the cancer cells, and their elimination becomes natural and systemic again. In some cases, however, the antibodies cannot be controlled and may trigger autoimmune diseases. We still have a lot to understand!

How many immunotherapies are used?

In clinical practice, oncologists essentially use those which block the PD-1 protein or a molecule (ligand) associated with it (PD-L1). But there is a whole string on the way with between 10 and 20 new targets in the near future. It is believed that they will be used in combination with these anti-PD-1s.

Because they work well with melanoma and lung cancer but not with other tumours?

Depending on the cancer, the mechanism to evade the immune system is not necessarily the same. PD-1 and PD-L1 are important in melanoma and lung cancer, less in other cancers. Added to this is the immunogenicity of cancers. In other words, is the cancer still
identifiable once all the escape mechanisms have been removed? The answer lies mainly in the number of mutations. The more there are, the more cancer cells will be visible by the immune system. Tobacco causes a lot of mutation in lung cancer, while brain cancers have a few mutations. This does not mean that they will not eventually respond to immunotherapies.

These therapies are very different from conventional drugs. What is the role of pharma companies in their development? Clinical studies to validate these products cost hundreds of millions of francs and it is difficult to do without the pharma industry. Still, the academic has a say in basic research and in the development of therapeutic strategies. Dozens of clinical studies are initiated by the CHUV either with pharma partners or independently when we are trying to push for our own discoveries. The group of George Coukos, head of the Department of Oncology UNIL CHUV and director of the Ludwig Institute for Cancer Research Lausanne, has developed its own studies on cellulothepies which consist of extracting certain dormant immune cells in tumours and boosting them before reinjecting them to do their job of eliminating cancer cells.

Again an almost natural approach. You mentioned possible autoimmune side effects, what are they? Nothing is more specific than a white blood cell. Its ability to move against the right target is phenomenal. That said, these immunotherapies do not only awaken cancer-specific lymphocytes. We can also wake others with the risk of triggering autoimmune attacks. These therapies require a lot of knowledge of the management of side effects at the clinical level.

Hence the idea of bringing research and clinical development closer in Agora? Agora will bring together researchers and clinicians who need their mutual experience to advance tomorrow’s oncology and personalisation, the other coming breakthroughs. To personalise therapies, we have to measure a lot of things. An entire floor of Agora will gather these statistical analyses, from DNA sequencing to imaging. On the other side we are standardising the electronic patient records at the CHUV to follow precisely how patients respond to treatments. By combining these data with those from molecular analyses, imaging, and so on, we will be able to begin to predict the efficacy and toxicity of a treatment. It will guide therapeutic choices.

How will Agora be connected with the needs of patients and their referring physicians? We have already created with the HUG a “tumour board” which network many oncology specialists in French-speaking Switzerland to discuss and interpret complex molecular data to make treatment proposals. We have just launched a national project, the Swiss Personal Health Network, to pool the data of personalised medicine. The Swiss population is very stable. So we hope to get information that tells us which is the most effective treatment sequence for a given patient in the long run. This is another revolution that is coming because it will allow us to determine on a molecular basis the populations in which treatments will have significant success rates.
A booming economy supported by an innovative life science sector

The life sciences sector fulfils an important role in the Swiss economy in general and in Western Switzerland specifically. In particular, the medtech industry has thrived thanks to the regional historic expertise of microtechnics and watchmaking (see chart below). Supported by the seven cantons in the region, Berne, Fribourg, Geneva, Jura, Neuchâtel, Valais and Vaud, Western Switzerland has the most diversified life sciences cluster in the world, called BioAlps. Western Switzerland is home to 1120 life sciences companies, 39 life sciences academic institutions, and 58 public and private support organisms. While each canton has its specificities, all are tightly interwoven to create a singularly rich tapestry of competencies and achievements, opportunities and specialisations, stimulating the region’s innovation and competitiveness.

As 99% of the Swiss economy is driven by small and medium enterprises (SMEs), Western Switzerland has made a concerted effort to create incubators and accelerators to encourage the creation of start-ups. Mass Challenge, Eclosion, Fongit, Fri Up, Fusion, Neode, Y-Parc, InnoBe and The Ark all focus on driving innovation and fostering entrepreneurship by connecting startups with the experts and resources they need to grow. From financing to proof of concept with industry partners to market launch, there is easy access to the ecosystem which includes business angels, venture capitalists and corporations.

A new 9,100 m² building called the SE-B extends the Lausanne (Vaud) BioPOle, which houses both start-ups in the marketing phase and companies that are leaders in their field. New tenants in the SE-B building already include the medical analysis company Unilabs and the Lausanne-based scale-up Abionic, which has developed a device enabling ultra-rapid screening for the risk of sepsis. StartLab is...
Biopôle’s new incubator, dedicated to the support and commercial development of innovative scientific projects.

Campus Biotech, based in Geneva with a population of 1,200 highly qualified life sciences professionals, constitutes an unusual model which groups together university researchers, startups, SMEs, and international health organisations such as GAVI, the vaccine alliance. This rich environment leads our attractive startups to flourish. For example, Lundbeck recently acquired Prexton Therapeutics. Agilent acquired Genohm. After having raised the largest investment round for a Swiss startup in 2016, ADC Therapeutics ranked top of 20 VC rounds in 2017 with CHF 197 million, while Obseva was listed on Nasdaq.

A number of high performance centres of competence are concentrated in Western Switzerland. The Swiss Integrative Center for Human Health (SICHH), comprised of a network of 10 academic partners, was imagined by the University of Fribourg and the Fribourg Cantonal Hospital; it is hosted in blueFACTORY in Fribourg. SICHH was developed to provide both academia and industry with custom R&D services, with the latest available equipment in spectroscopy and microscopy, sequencing and computing power. Based in Monthey (Valais) since 2016, Swiss Biotech Center (SBC) acts as a competence centre open to innovative companies, academic researchers, developers and young entrepreneurs. SBC turns biomedical research of academic institutions and small companies into products, providing support to innovative biopharmaceuticals and in vitro diagnostics companies, with a specific focus on point-of-care tests.

The Center of Excellence in Characterisation (CEC) brings together experts and methods from CSEM, the Haute Ecole Arc (HE-Arc) and the Paul Scherrer Institute (PSI). Based in Microcity in Neuchâtel, which is part of the Western Switzerland Innovation Park (SIP) network, CEC builds on the microtechnical heritage of the Neuchâtel region, as applied to the life sciences. A centre for artificial muscles is opening in one of EPFL’s offices in Neuchâtel. Indeed, researchers from EPFL’s Integrated Actuator Laboratory based in Microcity, Neuchâtel, are already working on a new assistance system for cardiac failure. Also in Neuchâtel, startup One Drop Diagnostics is developing innovative photonics technology which measures multiplexed assays from the surface of microfluidic chips. In Lausanne, Lunaphore Technologies SA is developing a next-generation technology for cancer tissue diagnostics, using fast fluidic exchange (FFeX) microfluidics technology.

With the excellence of its teaching and research institutions, Western Switzerland has become a hub for research and development in the fields of oncology, auto-immune and inflammatory diseases. There have been strong developments in oncology. The Agora translational cancer research centre in Lausanne groups together over 300 cancer researchers from different partner institutions. The ISREC and the Ludwig Institute for Cancer Research, the University Hospitals of Geneva (HUG) and Lausanne (CHUV) and the University of Lausanne are all members of this single site in Lausanne.

The Swiss Cancer Centre Leman (SCCL) leads cutting-edge basic
and translational cancer research in personalised molecular therapies and immunotherapies with the aim of developing outstanding multi-disciplinary care for cancer patients. The SCCL is a truly integrated research community whose multidisciplinary cancer research programmes offer the most innovative approaches and therapies for cancer patients.

Increasing recognition that research on autoimmune diseases is still in its infancy has led to further efforts in identifying and treating such conditions. Startup Augurix, in the Valais, designs, produces and markets companion diagnostics devices to facilitate early diagnosis and confirmation of gastro-intestinal diseases, notably celiac disease. The CHUV has recently inaugurated a cell production facility for immunotherapy in the Biopolie in Epalinges (Vaud).

This dense ecosystem and efficient infrastructure attract significant foreign investments. The existing talent pool, favourable business environment, and proximity to leading academic institutions are enticing. Celgene, based in the canton of Neuchâtel, is building its second production plant in Couver, Val-de-Travers, followed by the construction of a third production site in the canton, in Boudry, to produce oral treatments to treat patients with inflammatory bowel diseases. American oncology specialist Incyte is investing $100 million for a monoclonal antibody production site in Yverdon (Vaud) and has installed its EMEA headquarters in Geneva. In Vaud, American cancer diagnostics and pharma services company NeoGenomics settled its European headquarters there.

It is this diverse, dynamic and creative life science ecosystem that BioAlps maintains and promotes, due to its excellence and performance in local, regional and international markets. BioAlps bolsters innovation and nurtures creativity in research, education and business, enabling novel products and services to reach the market efficiently and quickly. BioAlps is the entry point to a wealth of contacts, knowhow, knowledge and provides both personal and institutional support and thus contributes to maintaining the high position of Switzerland in international rankings.

MR. PHILIPPE LEUGA
Minister of Economic Affairs, Innovation and Sport, Canton of Vaud

MR. JEAN-NATH KARAKASH
Minister of Economy and Social Affairs, Canton of Neuchâtel
President of the Conference of Economic Departments of Western Switzerland Cantons (CDEP-SO)