Why Switzerland continues to punch above its weight as a global biotech hub

To understand Switzerland's continued success in the biotech sector and gain personal insights, Lu Rahman spoke to Michael Altorfer (CEO of the Swiss Biotech Association), Jan Lucht (Head of Biotechnology, scienceindustries), Claude Joris (Secretary General, BioAlps), and Carole Delauney (Business Development Director at swissfillon).

Jan Lucht, Head of Biotechnology, scienceindustries

Michael Altorfer, CEO of the Swiss Biotech Association

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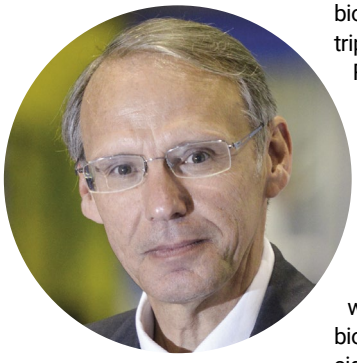

Claude Joris, Secretary General, BioAlps

With a population of just 8.5 million people, Switzerland's prominence in the biotech sector is remarkable. Last year, in collaboration with partners around the world, it played a key role in the international response to the Covid-19 pandemic. From 2019 to 2020, capital investments in Swiss biotech companies almost tripled, reaching US$3.7 billion, R&D spending increased by 10%, and high quality patent output helped to maintain Switzerland's position at the top of the Global Innovation Index for the tenth consecutive year. While the spotlight was on Covid-related projects, biotech companies did not lose sight of other unmet medical needs and continued to invest heavily to expand their R&D and manufacturing infrastructure, and to advance and broaden their portfolio of drug candidates and new modalities.

LR: What is your experience in the European biotech sector and how have you seen this sector change over the last 5-10 years?
MA: I started working in multinational pharma companies and later joined the management team that built up the biotech company Polyphor. I've been CEO of the Swiss Biotech Association since 2018, where my role is to support biotech stakeholders and collaborate with other associations to optimise the industry framework conditions internationally.
JL: I have an academic research background in microbiology and plant biotechnology, and headed an association

focussing on biotechnology for food production. I joined scienceindustries, the Swiss association for Chemistry Pharma Life Sciences, in 2011; our members include many of the global players in the healthcare and biotech sector, and we support them with political lobbying and communications.

CJ: I've been with BioAlps for the past eight years. Our aim is to promote Western Switzerland as a world class centre for life sciences and to foster growth by creating synergies between academia, entrepreneurs, investors, authorities and new businesses. I've also recently taken on a role as president of the Swiss Integrated Center For Human Health (SICHH).

CD: I'm a French national based in Montpellier and have led numerous business development teams for rapidly growing companies involved in R&D, medical devices and contract manufacturing, in France, Switzerland and the UK. I joined swissfillon, a fill & finish CDMO, in September 2020.

Discussion

The international biotech industry is driven by innovation and has evolved rapidly over the past decade. During this time there has been a step change not only in medicines, but in equipment and techniques available to medical practitioners. During the COVID-19 pandemic we have seen the value of pure research in the development of vaccines by Pfizer and Moderna among others, and an increased willingness to invest in biotech.

Perhaps the most significant change for biotech - not only in Europe, but globally – has been the arrival of the new enabling genome editing tools like CRISPR/Cas9, their continuous technical improvement, and their incredibly rapid uptake as a tool for R&D. Twenty years ago, it took weeks to decode one section of DNA, but this can now be performed in a matter of hours. This impressive development in genomics and the sharp drop in DNA sequencing costs has brought about new drug treatment modalities. Major breakthroughs of micro technologies such as flow chemistry and microfluidics have also supported advances in immuno-oncology, neurosciences and recently, infectious diseases.

Other trends that have been helping to shape and expand the sector in recent years include multinational pharma companies' increasing reliance on biotech companies to complement their product portfolio.

"Today, around two thirds to three quarters of new product candidates were initially discovered and developed by the external innovation hub of SME biotechs. The number of parties that have "skin in the game" in developing new therapies is increasing. Universities, hospitals, biotech SMEs, service providers, consultants and AI/data analysis firms are often involved alongside big pharma and increasingly willing and able to share the risk," says Michael Altorfer.

New modalities and new business models have generated more options to solve problems and to focus a therapy on a distinct patient group, leading the way to personalised medicine. Cell and gene therapies have the potential to cure diseases, rather than treating symptoms. The challenge is to automate processes to bring down costs

and make treatments widely available. The global cell and gene therapy market was valued at US$2.6 billion in 2020 and is predicted to grow to US$25 billion by 2027 - to put this in context, the market for top selling drug Humira (AbbVie, Eisai) was alone worth US$20 billion in 2019.

"As the biotech sector grows, investors and management teams have become savvier and more effective in starting new ventures, killing failing projects early and in financing and developing products effectively. The pandemic has brought some challenges in term of supply chains, and the pharma industry may have to re-think the way it works. A willingness to embrace change is likely to bring dividends," Carole Delauney adds.

LR: How have you contributed to the changes?

MA: The Swiss Biotech Association has fostered collaborations nationally and internationally, and made the Swiss biotech hub more transparent for international partners. We have helped Swiss biotech companies access talents, funding and technologies, and have collaborated with international partners to optimise and align the international framework. As a post doc I was involved in research into the 3D structure of peptides. At Polyphor I was part of the team developing technology/drug classes in different indications (respiratory, antibiotics, immuno-oncology) and helped to demonstrate that outsourcing could be effective, high quality and reliable.

JL: scienceindustries has about 250 member companies, many of them global players in the healthcare and biotech sector. We support them by fostering innovation and friendly regulatory and societal framework conditions. For biotechnology, an important aim is to enable the use of cutting-edge technologies, like genome editing, for all relevant sectors, and a broader use of biotech approaches for the development of a more sustainable circular bio-economy.

CJ: Switzerland has world-class research institutions and hospitals but most important is the strong collaboration between the academic institutions and entrepreneurs and venture capitalist that are the drivers behind the success of this sector. Western Switzerland has become vibrant as a modality hotspot for immunotherapy, cell and gene therapy, and for investments which have contributed to the success of biotech start-ups.

CD: As a business development specialist, I see myself as a facilitator. I help connect people who don't know each other but who have the same goal: to solve existing problems and find a way to advance drug product development. I've focused on fill & finish for 15 years and can easily understand if the company I work for has the necessary capacity and expertise to help potential customers. If not, I can suggest other CMOs which may be able to meet their needs. By collaborating rather than competing, we can help the industry to move forward.

The opportunities for drug discovery and development

A more personalised approach

Every disease manifests itself with different and unique aspects in each patient, and this variability affects the response of the disease and the patient to therapy. In the past, treatments were geared to the average response of large groups of patients, but current approaches also consider factors such as age, sex, and health status.

As we make progress in collecting, consolidating and analysing data from patients and healthy volunteers, we can improve our understanding of how patients differ from healthy people, and the variation within patient groups. This will enable the development of more focused and effective therapies and, in extreme cases, lead to individualised therapies such as cell-based therapies. In this way, new technologies and modalities

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will have the potential to cure diseases and/or regenerate tissue and muscles.

Improved range of therapies

Greater understanding of the function of the brain, the immune system and the microbiome will facilitate progress in areas in which we have so far failed to deliver effective therapies. An example of this is the advances that have been made from the original chemotherapy to the highly sophisticated immune-oncology therapies that are now available, which can restore the ability of the immune system to kill cancer cells.

Major breakthroughs in cancer treatments are expected, and the thousands of rare and orphan diseases not currently addressed will open the door to an exciting world of drug discovery. Digital health care and personalised medicine are likely to increase the demand for a wider range of active substances.

More effective drug development

New and improved technologies for drug discovery and

development including increased automation, novel screening platforms and in vitro tissue models as well as advanced molecular tools (like genome editing) will facilitate and speed up the progress to a new drug candidate. Further opportunities are offered by the advances of synthetic biology.

"Many APIs are based on natural substances, often with limited and unreliable availability. Advanced metabolic engineering of production organisms will allow access to unlimited quantities of the desired drug, and precision improvements to the molecule," says Jan Lucht.

Novel approaches to data collection for personalised healthcare include the use of genomic sequence information, gene expression data and molecular health markers in combination with integrated clinical data. The analysis of health data from large groups of patients will give a better understanding of the disease, supporting the development of new APIs and opening avenues to new treatment approaches. At the same time, tailor-made treatments for individual patients will improve outcomes, and expand the spectrum of therapeutics that can potentially be used to treat a given disease.

In the long term, the integration of real-world data will complement and accelerate clinical development for some treatments. This 'organ-on-a-chip' approach could boost drug development and drug testing by creating organoids from real human cells, using a multiorgan 3D model representing the cell's natural environment. Medicines derived through these advancements include cell-based therapy medicinal products, genetic therapy medicinal products, tissue-engineered products, and products integrally combined with medical devices.

Achieving better outcomes

"More specific targeting of treatments, made possible by new digital and analytical technologies, will lead to an improved risk-benefit ratio for patients. A more targeted approach increasingly allows the development of new treatments for small patient segments, up to 'segment of one' indications," Jan Lucht believes.

In addition to drug discovery, drug repurposing for new disease indications holds the promise of rapid clinical impact at a lower cost than new drug development. Lack of a comprehensive library of clinical compounds suitable for testing has cut this advance but the rapid development of bioinformatics platforms and use of smart data analysis will identify opportunities more systematically.

Growing therapeutics areas

Recently the most striking progress has been in oncology and CNS treatment. Although they currently represent only small part of the total market, cell and gene therapies and regenerative medicine are now providing cutting-edge solutions, and biotech companies specialising in these advanced therapeutics, CRISPR and the integration of AI across the life sciences will probably drive the industry in the coming years.

Important growth areas pursued in Switzerland are oncology, neurological and immunological disorders, cardiovascular and metabolic diseases, ophthalmology and dermatology. Switzerland is a leader in the antibody modality, with tailor-made antibody mimetics, for example DARPins, offer great now therapeutic options. Also, novel approaches to deal with hard-to-treat or novel infectious diseases are gaining importance as more streamlined and focused approaches increasingly lead the way to the development of therapeutics for rare/orphan diseases, supporting patients who until now had only limited treatment options.

The rapid development and success of mRNA vaccines to fight the COVID-19 pandemic will certainly boost the application of this technology for other targets outside vaccine production. Cell-based therapies for a variety of disorders, including allogenic approaches, are advancing, with a steadily expanding palette of applications. Also of increasing importance is the development of products and treatments that act through targeted effects on the human microbiome.

European biotech regions of excellence

With a landscape centred on innovation and scientific development, many pharma/biotech companies enjoy the benefits of being based in Europe. Europe is a powerhouse in research and industry know-how, and has the expertise to support innovation and basic research. It is not surprising that many different regions in Europe have been expanding and diversifying their biotech activities and expertise over the past decade. This is true for the Nordics, the Baltics, Benelux and Denmark, Spain and France and the UK, and Ireland is particularly strong in manufacturing.

A recent McKinsey study indicates that half of European biotech companies are based in France, Germany and UK. Since 2018, the largest absolute increase in the number of companies has been in Switzerland and France, with the strongest relative growth over the last three years observed for Switzerland. The massive public investment in infrastructure and increase in dual public-private partnerships together with the busy IPO market on the Euronext, SIXT, London and Frankfurt stock exchanges and growth in venture capital investment are helping expand this sector.

"Switzerland's healthcare industry ranks second on the Global Industry Competitiveness Index 2020 (after the USA). Besides being home to some of the largest pharma companies in the world, and the European leader in antibody technology, CNS disease treatment and dermatology, it also has a flourishing biotech start-up scene," explains Jan Lucht.

Among European countries, only the UK founded more new biotech ventures in the last three years (31%). France and Switzerland were on a par with 16% of all new biotech companies each. Capital investments in Swiss biotech firms almost tripled from 2019 to 2020 reaching US$3.7 billion.

Favourable framework conditions in Switzerland, including a highly qualified workforce, a stable economic and political system and a network comprising research institutes, companies and government institutions, support a strong development of the knowledge-driven biotech sector.

"The time taken to obtain a licence for a new pharmaceutical product from Swissmedic (the Swiss Agency for Therapeutic Products) is one of the shortest in the world, and the registration process for the healthcare system lends itself to efficient pharma development and clinical testing," explains Claude Joris.

"The fact that we have seen more than a tenfold increase in capital influx since 2010, and tremendous investments in R&D and manufacturing plants shows that investors recognise the value and attractiveness of the Swiss biotech portfolio. Today, we count more than 1,000 biotech companies in the Swiss Biotech Directory, and the value of the pharmaceutical products the Swiss biotech and pharma companies exported in 2020 exceeded US$100 billion, corresponding to 44% of the country's total exports," adds Michael Altorfer.

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What challenges does the sector faces and how can they be overcome?

While Europe has been a longtime leader in healthcare, it must continue to innovate to avoid falling behind the US and a strongly growing China. Areas of concern are innovation, investment, and patient access to innovative healthcare.

International collaboration is the key to success. Sharing scientific results and discovery has enabled more scientists to excel and amplify the effects of a new discovery. It is important that successful European biotech entrepreneurs who have generated jobs, advanced science and healthcare, and taken significant risks should be recognised and celebrated.

Globally, the high cost of leading-edge therapies is a challenge for national health care models or insurance reimbursement schemes. Here, new performance-based pricing models and adapted payment schemes with extended installments for one-time therapies could offer solutions, but in many cases they would have to be accepted and adopted by governments. Reducing the time that medical professionals have to spend with patients will have a significant impact in reducing costs, and will help to maximise the benefits new therapies. From the earliest stage of drug development, it is important to consider not only formulation, but also how the drug will be delivered to patients. Subcutaneous delivery of injectables, the use of larger cartridges, and autoinjectors and portable devices which the patient can use at home will all have a role to play.

More generally, the discussion around reducing drug pricing is making it increasingly difficult to convince investors to engage in this sector. We should consider what is fair remuneration for an innovator who bears the risk and finances the development of innovative drugs, given that the vast majority of research projects fail to yield a commercial product. At the same time, we must assure access to innovative drugs for patients who cannot afford to pay this market price, both in the developing world and in richer nations. The COVAX initiative that currently aims to secure the funding and sufficient production of Covid-19 vaccines, provides a good example of what can be achieved.

Restrictive data protection regulations are in danger of hampering research and development, and the efficient treatment of patients. A collective political will is required to reverse this trend in Europe, including better collaboration between the public and the private sector, a more efficient use of health data, and an innovation-friendly regulatory system that makes novel health solutions accessible to the people who need them.

What does the future hold?

Despite these challenges, increasing demand will drive a strong long-term growth of the global healthcare market, with a further expansion of the number of drug modalities. This is especially relevant for Switzerland, where the life sciences (pharmaceuticals, vitamins and diagnostics) is a major export sector.

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The future holds great promise due to AI, data analysis, new modalities, personalised medicine, and the increasing ability to cure and even regenerate. The future in biotech will be the switch from 'what the doctor sees' today to 'what the doctor does not see' in the future, with the tracking of biomarkers, new high-resolution medical imaging, AI, wearables and implantable devices.

"There is likely to be more cross-fertilisation between different disciplines, accelerating the convergence of medtech, IT and smart clinical data, micro-nanotechnologies and biopharma. This will allow more accurate disease detection, therapeutic efficacy in both general populations and individuals, and open up a new frontier in "precision medicine"," says Claude Joris.

But linked to this progress, there will also be a fierce debate about what can be afforded and who can have access to different types of medicine. The more we offer personalised or individualised solutions, the more the development cost per patient increases. As new technologies become established, typically we are able to lower costs. Nevertheless, the financing of highly targeted therapies (e.g. cell-based therapies) may not be possible initially within existing healthcare models. The financing of medicine for patients who cannot pay the market prices will require an intense international financing and coordination effort. Such an effort will pay off, as it will help to eradicate certain pathogens and diseases, save countless lives, and increase the quality of life for many patients.