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Swiss Biotech Report 2022

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“In 2021, the Swiss Biotech Industry saw a saw a record-high revenue figure of CHF 6.7 billion, compared to CHF 4.9 billion the previous year. R&D investment of CHF 2.6 billion also stands out as a new record. .”

Frederik Schmachtenberg
EY Life Sciences

“In 2021, exports from the Swiss life sciences sector increased to a record CHF 109 billion (+9% over 2020) accounting for 42% of the total Swiss exports. Especially strong was the growth of the immunologicals, with an export value of CHF 45.8 billion (+23.7%).”

Jan Lucht
scienceindustries

“Switzerland relies almost exclusively on the private sector to establish a thriving startup environment. It fosters innovation at arm’s length by funding Public Private Partnerships to promote close collaboration between academic research groups and industrial partners.”

Michael Altorfer
Swiss Biotech Association

“The Sparks section of SIX Swiss stock exchange aims to provide the missing link in the financing ecosystem, offering biotechs an earlier route to market, and VCs earlier exit options. The ambition is also to attract companies in earlier stages of development from outside Switzerland.”

Fabian Gerber
SIX Swiss Exchange

Table of contents

Guest editorial

Ignazio Cassis
President of the
Swiss Confederation

Switzerland – a global innovation hub

The world is facing major challenges. To date, humankind has been unable to find a final solution to preserve peace or to combat poverty or climate change. It is an illusion to believe that there is an immediate, ready-made cure for all problems. What we need is a work in progress approach: a continued willingness to bring together ideas from different fields and to develop them further in the light of scientific knowledge and in anticipation of chaos-theoretical linkages. Every year, individuals, national governments, corporations and organizations invest substantial amounts of money and time to master the challenges of our time. What the most forward-looking among them have in common is a relentless quest for innovation – a constant pursuit of new technologies, new products, new processes and, above all, new ideas.

Plurality as a source of innovation

Innovation can only come about with competing ideas. Individuals should be attracted by the plurality of ideas, curious about differences and eager to understand them. They should meet and challenge their own ideas and finally test them on a wider public. This is how humanity progresses. You can only break new ground if you set out to look for it. And for that, we need a thriving landscape of all kinds of ideas and opinions, in particular those who challenge us to think outside of the box, instead of following mainstream opinion. Collaboration through trial and error is the engine of innovation.

Switzerland, with its vibrant democracy, its different languages, religions and cultures, brings forth such interactions every day. Located in the heart of Europe – at the crossroads of people's paths – Switzerland's broad diversity of opinion has shaped our country for centuries as a location for innovation. Without natural resources, Switzerland had to invest in intellectual endeavors and has always been home to researchers and inventors. No fewer than 23 scientists with Swiss citizenship have won the Nobel Prize in the natural sciences and in medicine. No country has more internationally registered patents per million inhabitants than Switzerland. One of the main reasons for this lies in the fact that the Swiss innovation environment is positioned very broadly: with state-funded basic research on one side, and a broad initiative of private organizations on the other, working together hand in hand.

Convergence accelerates progress

However, the biggest challenge is to put all this discipline-specific expertise on a broader, cross-sectoral foundation. When the problems of our time are fast-moving and disruptive, we need to get our answers from outside our comfort zone and connect them across different fields. This convergence of sciences is expanding the field of scientific discovery and accelerating technological progress. This is why the Federal Government has created the GESDA-Foundation (Geneva Science and Diplomacy Anticipator). Bringing together ideas to foster collective innovation, thus developing solutions to turn new technologies into opportunities – this is our strength.

Switzerland is focused on maintaining its position as an international innovation hub in the future: it is not a matter of predicting the future – an unrealistic objective even for the most innovative minds – but rather of anticipating possible developments and preparing society for this transformation. To quote the GESDA-Foundation: 'let's use the future to shape the present'.

Editorial Swiss Biotech Report 2022

Michael Altorfer
CEO,
Swiss Biotech Association

For more than a decade Switzerland has been placed top of the annual Global Innovation Index published by the World Intellectual Property Organization (WIPO). In the life sciences, three pillars, "Knowledge and Technology Output", "Infrastructure" and "Creative Outputs" are the key factors contributing to the sector's sustained success. During the COVID pandemic, the Swiss biotech hub, already considered one of leading global centers for biomedical innovation, further enhanced its international reputation by leading numerous initiatives to combat the spread and effects of the virus. In addition, forward-looking indicators, such as the number of world-class patents filed, investment in manufacturing and R&D infrastructure, and the ability to attract financing and talents, indicate that Switzerland remains well positioned for the future.

Last year we expressed some caution that the COVID pandemic might take its toll and that the Swiss inclination not to intervene in the free market, and to avoid providing direct government support for venture-based startups and small/mid-sized R&D companies, could backfire and weaken the innovative power of Switzerland. However, record levels of financing in 2020 and 2021 suggest that global biotech investors continue to recognize the attractiveness of investment opportunities on offer.

Given the small size of their domestic market, Swiss-based biotech and pharma companies have always focused on the global market and invested heavily in international collaborations and R&D networks. It is therefore not surprising that Switzerland played an important role in the global effort to combat the pandemic, and that two Swiss based companies were successful in developing treatments to combat COVID infections (Humabs BioMed/Vir Biotechnology and Molecular Partners/Novartis).

At the same time, Switzerland continued to invest in other areas with global unmet medical needs. In 2020 and 2021, Swiss biotech companies attracted close to CHF 7 billion in new funds - the vast majority of these funds were directed to indications other than COVID, e.g. immune-oncology and neurology or emerging fields such as the microbiome and cell-based regeneration. In parallel to the development of novel treatment options, investors also supported data-driven business models to enable the development of digital therapeutics or personalized medicine. The very successful IPO of Sophia Genetics and the recent MDR certification for the Floodlight Application for multiple sclerosis patients from Roche demonstrated the attractiveness of such data-driven approaches.

Switzerland is continuing to prioritize attracting top talent to sustain the growth and innovative power of its biotech hub, and is also further expanding international collaborations. New bilateral agreements (e.g. with Indonesia) support the extension of its global network, and the country is also seeking to reestablish its full association with Horizon Europe.

Another indicator of innovation is the flourishing startup scene in Switzerland. The new SPARKS capital markets segment, recently launched by SIX Swiss Exchange should provide a further boost by offering a cost-effective listing option that facilitates access to global capital markets.

Therefore, on behalf of all the partners of the Swiss Biotech Report 2022, I encourage you to dive into the articles in this year's report that each consider the main topic of "Swiss sources of innovation" from a different perspective. They highlight the power of private public partnerships, translational research networks and international collaboration. They demonstrate that Switzerland can continue to build on a strong foundation while expanding its international network and ensuring that its sources of innovation never run dry.

Swiss Biotech 2021: Facts & Figures

Frederik Schmachtenberg

EY Partner, Financial Accounting Advisory Services

In 2021 the global biotech industry was again performing at new heights, considering the worldwide launch of various new vaccines as protection against COVID-19, as well as therapeutics to address COVID-19. Companies like the German BioNTech (together with Pfizer) and the US company Moderna (with strong support from the Swiss CMO Lonza) were able to develop and launch new mRNA-based vaccines in record time.

Biotech IPOs continued to be "en vogue" although the number of SPAC transactions started to slow down somewhat in 2021. The IPO class of 2021 recorded a total of 143 IPOs (2020: 73), which generated more than USD 19.3 billion in funding (2020: USD 11.2 billion). The significant increase in IPOs can mainly be attributed to the high count of US SPAC transactions.

99 US IPOs (2020: 63) were able to collect a total of USD 15.7 billion (2020: USD 10.5 billion).

In Europe, biotechs successfully completed 44 IPOs (2020: 10), generating USD 3.6 billion (2020: USD 0.7 billion).

Swiss biotech landscape

In 2021, the Swiss Biotech industry saw a record-high revenue figure of CHF 6.7 billion (2020: CHF 4.9 billion). Such significant uptick was mainly driven by an increase in product sales, favorable one-time events from collaboration and licensing deals, as well as a general positive advancement of the product pipeline and, as a result of that, regulatory approvals continuing at very high levels (also refer to the product development section below).

Swiss biotech financing

The Swiss biotech industry was able to raise more than CHF 3.3 billion in 2021, with roughly CHF 2.5 billion collected by public companies and the remaining CHF 0.8 billion collected by private companies. Anaveon and Numab Therapeutics recorded the largest private company financing transactions in 2021, with CHF 110 million and CHF 100 million raised, respectively. Furthermore, several biotechs benefited from cantonal COVID-19 loans as well as the COVID-19 innovation program financed by the Swiss government.

PUBLIC COMPANIES	CHF MILLION
Idorsia	600
Bachem	584
Sophia Genetics	234
CRISPR	229
PolyPeptide Group	191
Total	**1,838**

Table 1: Largest 2021 public rounds

PRIVATE COMPANIES	CHF MILLION
Anaveon	110
Numab Therapeutics	100
Alentis Therapeutics	60
Anjarium Biosciences	57
Oculis	52
Total	**379**

Table 2: Major 2021 private transactions

A number of successful European IPOs were also announced in 2021, five of which either involved Swiss companies or used SIX SIX Swiss Exchange as a platform. NLS Therapeutics, VectivBio, and Sophia Genetics all had their public market debut on Nasdaq during the 2021 spring/summer timeframe. The latter two were even able to execute successfully their "green shoe". Schlieren-based Molecular Partners did a secondary listing on Nasdaq in the 3rd quarter of 2021. SIX Swiss Exchange took note of the successful IPO of Polypetide in the first half of the year and Idorsia also benefited from the favorable financial climate and placed a CHF 600 million convertible bond on SIX Swiss Exchange at the end of July 2021. An additional transaction noteworthy on SIX Swiss Exchange was the reverse merger transaction between Polyphor and EnBiotix (a private US biotech), which led to the creation of Spexis as a new company, assuming Polpyhor's spot on the trading floor in Zurich.

Last but not least, in late 2021 the recently founded company MoonLake Immunotherapeutics also started its preparation for an upcoming SPAC transaction on Nasdaq.

In spring 2021, Pureos Bioventures announced the final closure of its first fund BB Pureos Bioventures LP with a committed capital of USD 205 million. Pureos will exclusively invest in innovative private drug development companies with an emphasis on novel biological drugs and emerging modalities, such as nucleic acid, and cell and gene therapies.

M&A and collaborations

Swiss companies were involved in several significant M&A transactions:

- Mestex AG was acquired by Grünenthal Pharma
- Relief Therapeutics acquired Applied Pharma Research
- Novartis took over Cellerys
- Atlas Antibodies purchased the biotech service provider evitria
- Novaremed bought Metys Pharmaceuticals
- Inositec was acquired by Vifor Pharma, which itself was later acquired by CSL
- Alloy Therapeutics acquired deepCDR Biologics
- Merck acquired Chord Therapeutics to expand its neuroinflammatory pipeline

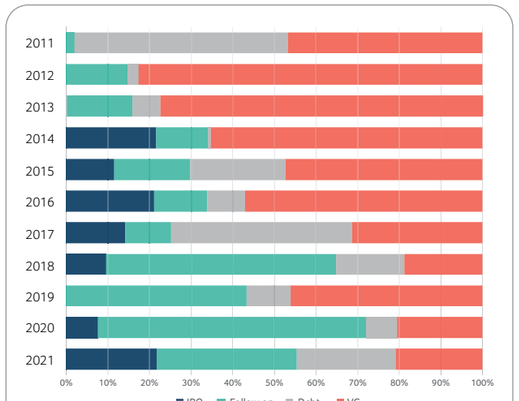


Figure 1: Biotech financing categories in Switzerland 2011 to 2021

Also, entering into license and collaboration agreements continued to be "en vogue" in 2021. A selection of such transactions is mentioned below:

- Lonza/Moderna entered a new agreement to double drug substance capacity production for Covid-19 in Visp
- Deep Breath Intelligence collaborated with Bayer
- Genedata/Sanofi extended their collaboration for pharmaceutical development & manufacturing science
- Organon/ObsEva entered into a global license agreement to develop and commercialize ebopriprant
- Molecular Partners/Novartis signed a collaboration to develop DARPin-conjugated radioligand therapeutic candidates for oncology

Swiss Biotech 2021: Facts & Figures

CONTINUED

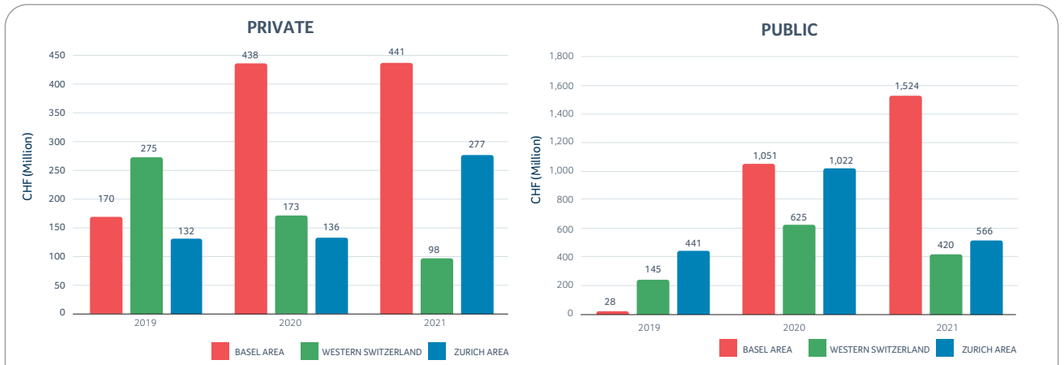
Product developments

In 2021, the industry saw a similar number of regulatory approvals compared to prior years. More specifically, EMA approved 91 new drugs in 2021 (2020: 97 drugs) and the FDA approved 50 new drugs (2020: 57 drugs), not counting the emergency use approvals for therapeutics in the fight against COVID-19, one of which originates from Humabs in Bellinzona.

Furthermore, among the new FDA approvals there were three new drugs, which the Swiss biotech sector can proudly claim as "originated in Switzerland", namely ADC Therapeutics' Zynlonta, Adumhelm from Biogen/Neurimmune, as well as Ponvory from J&J/Actelion/Idorsia.

The count of drug approvals by Swissmedic exceeded the prior year with a total count of 45 new drugs (2020: 42). However, and not unusually for the sector, some setbacks in clinical developments also had to be noted in 2021, for example with Polyphor's late-stage breast cancer study failure, which paved the way for the above-mentioned reverse merger transaction.

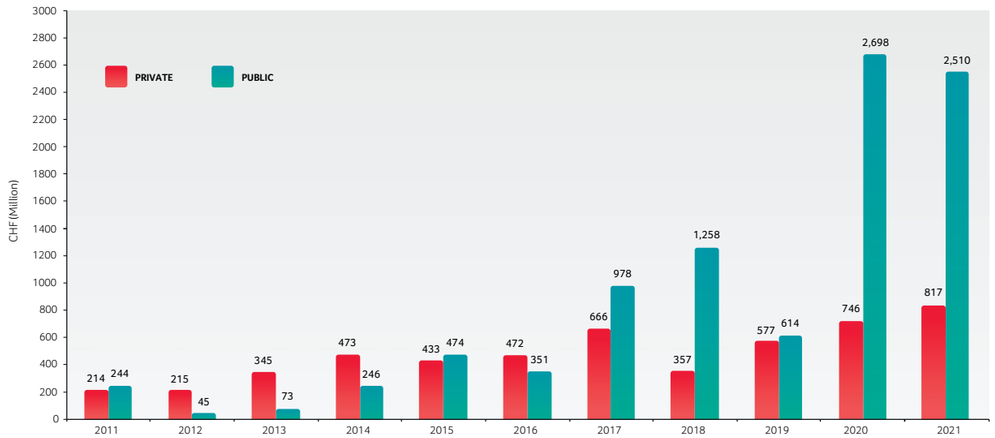
Private & Public Swiss Biotech Regional Financing - 2019-2021



The year in charts

Capital investments in Swiss biotech companies 2011-2021

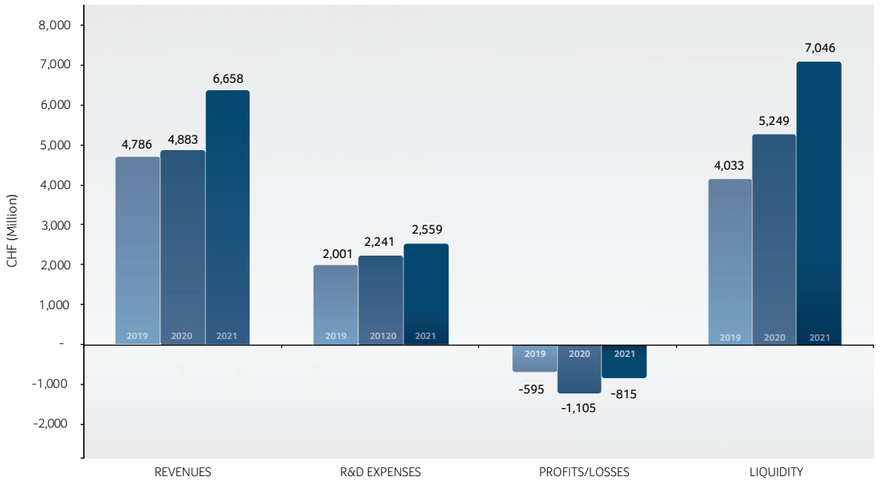
Private & Public Swiss Biotech Companies



Source: EY (Capital investments include convertible bonds)

Revenues, R&D expenses, profit/loss, liquidity 2019 - 2021

Total Swiss Biotech Companies

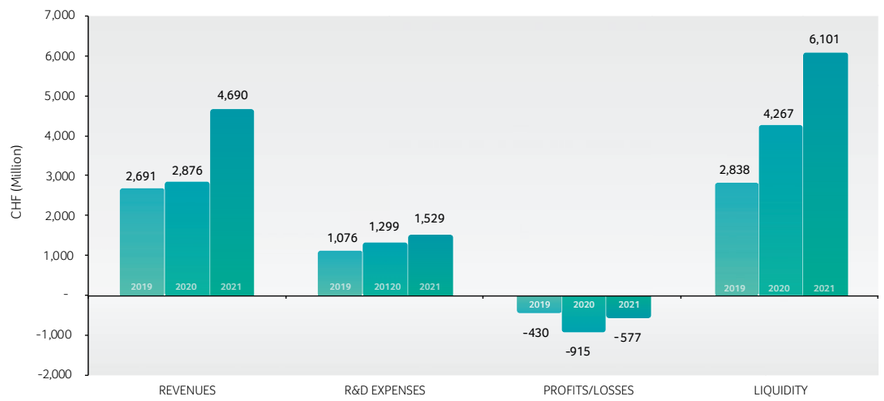


Source: Annual Reports, website information and EY

Note: The 2021 data in above tables is based on information that was available up until March 31, 2022. At this time, some of the companies had not yet disclosed their financial figures for 2021. Therefore some figures were carefully extrapolated on the basis of the latest interim data publicly available (i.e. Q3 or Q4 2021.

Revenues, R&D expenses, profit/loss, liquidity 2019-2021

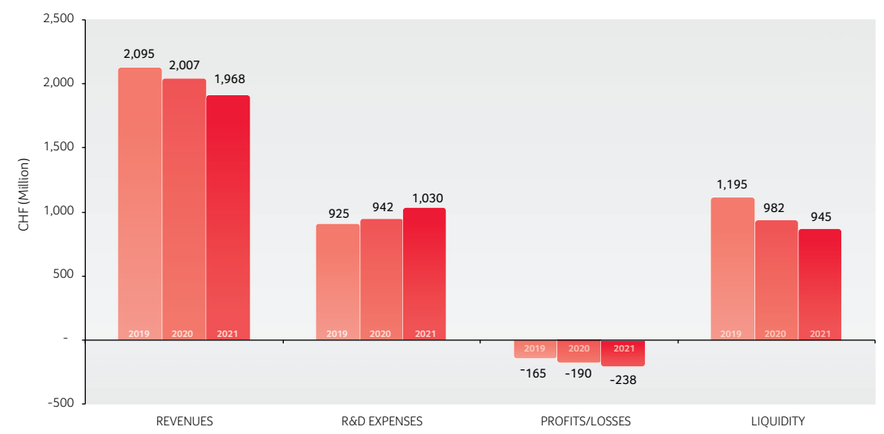
Public Swiss Biotech Companies



Source: Annual Reports, website information and EY

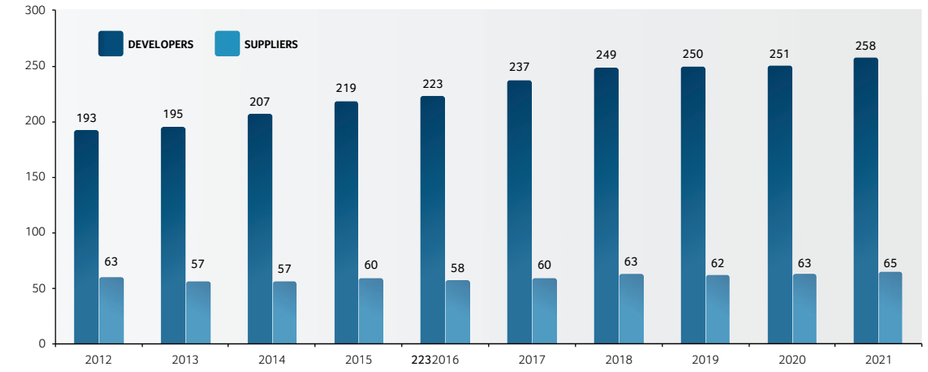
Revenues, R&D expenses, profit/loss, liquidity 2019-2021

Private Swiss Biotech Companies



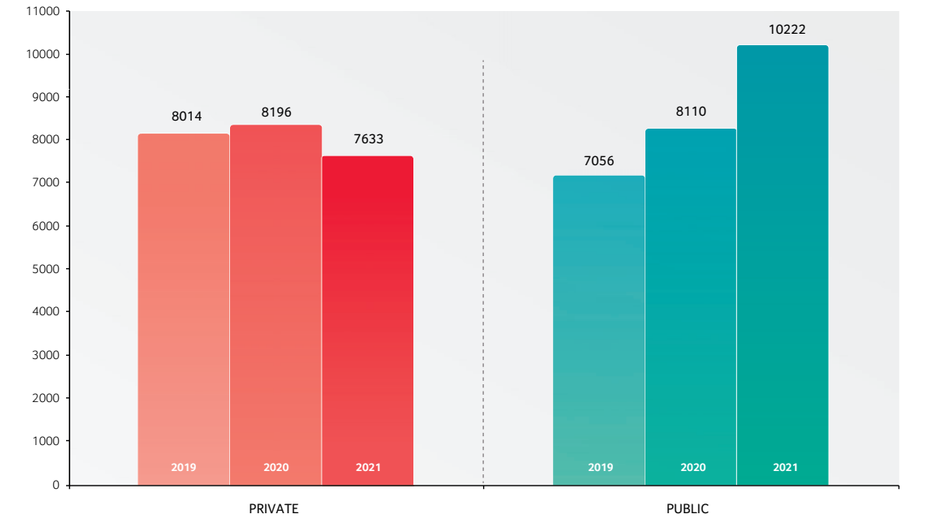
Source: Swiss Biotech Association, EY (incl. estimates and extrapolations based on prior year figures)

Number of Biotech Companies in Switzerland 2011-2021



Source: Swiss Biotech Association, website information, EY

Number of Swiss Biotech Employees 2019-2021



Source: Annual Reports, website information and EY

EXPORT STATISTICS:

The Life Sciences Sector as a central pillar of the Swiss Economy

Jan Lucht

scienceindustries | Head Biotechnology

In 2021, exports from the Swiss life sciences sector (pharmaceuticals, vitamins and diagnostics) increased to a record CHF 109 billion (+9% over 2020). This accounted for 42% of the total Swiss exports. Especially strong was the growth of the immunologicals subsegment that includes many biotech products, with an export value of CHF 45.8 billion (+23.7%).

In the year 2020, almost all industry sectors suffered from historical export declines due to the COVID-19 pandemic. Only the chemical, pharmaceutical and life sciences industries managed a moderate gain over 2019 (CHF 1.8 billion, + 1.6%). In 2021, all sectors were up again, and total exports grew by CHF 34.2 billion (+15.2%) to CHF 259.5 billion. The biggest contribution to this increase came from chemical and pharmaceutical products (+CHF 14.4 billion), including those from the life science industries.

A quarter of the total Swiss export growth in 2021, CHF 8.8 billion, was derived from immunological products, whose importance has been steadily increasing over the years (see Figure 1). They comprise biotech products like monoclonal antibody therapeutics, and also vaccines. In 2021, their impact was boosted by human vaccine exports of CHF 5.8 billion that also support the global fight against the COVID-19 pandemic.

While exports from all other sectors taken together grew by 44.7% from 2001 to 2021, life sciences sector exports almost tripled (+293%) over these twenty years. In 2013, life sciences industry exports surpassed that of the longtime leading metals and machinery sector. They have further expanded their lead since then. The products of the innovative Swiss life sciences industry therefore are indispensable components of the strong Swiss export economy.

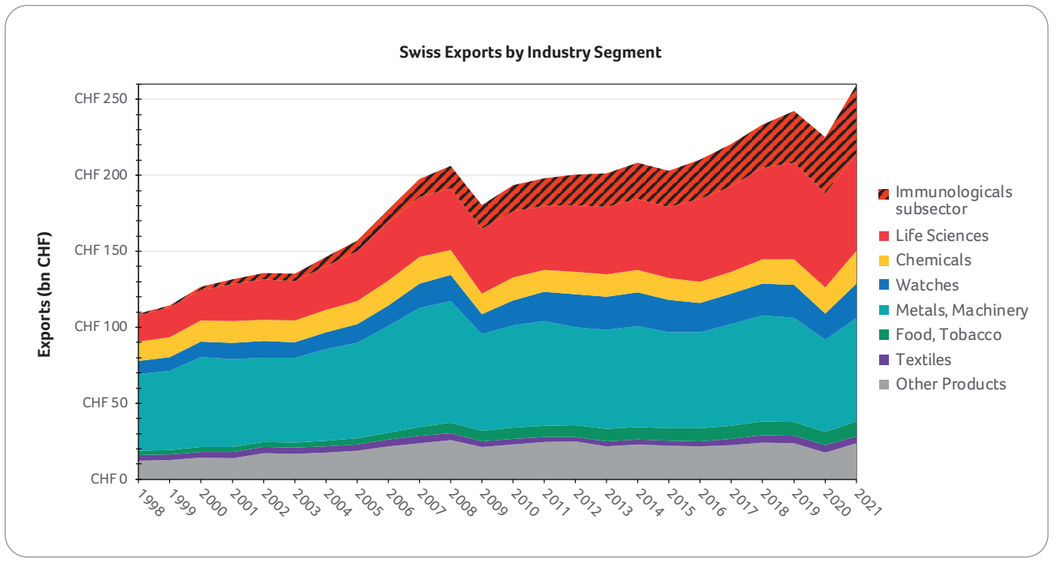


Figure 1: Annual Swiss exports according to industry sector demonstrate the increasing importance of the life sciences industries (pharmaceuticals, vitamins and diagnostics). This sector alone contributed 42% to the total Swiss exports in 2021 (Data: scienceindustries/Federal Customs Administration 2022, Swiss IMPEX database).

Why academia and industry need to talk to each other more

Florian Fisch

Swiss National Science Foundation | Science editor

Many innovations occur at the boundaries between different disciplines, says Ernst C. Wit, data scientist funded by the SNSF.

The more patents are filed and the more startups are founded, the happier politicians usually are. But do these measures really reflect a sustainable impact? Is Switzerland really the most innovative country in the world, as the Global Innovation Index has told us for the past eleven years? We asked data scientist Ernst. C. Wit how we should interpret patent data to improve our understanding of what the figures mean and how we can quantify the benefits to society that innovation brings.

A philosopher turned patent specialist

Ernst C. Wit is professor of statistics and data science at the Università della Svizzera italiana in Lugano and director of the Institute of Computing. He first did a PhD in philosophy, looking at moral reasoning in situations where uncertainty is inherent, and then gained a second doctorate in statistics. He has always found ways to apply his knowledge to the fields of biotechnology and medicine. In a project funded by the SNSF, he is currently analyzing patent citation networks (see box “Analyzing Patent Databases”).

Professor Ernst C. Wit

FF: *I always thought that innovation means bringing an idea into the market but you seem to see it in broader terms.*

ECW: Your definition of bringing an idea to the market is one element of a larger chain of events that constitutes innovation. At the core of an innovation is one or a small set of interconnected inventions. On top of that, there needs to be a larger group of applications of those core inventions that spur many types of products to the market. For all this to be real innovation, these products should have a significant value for society.

> *“The products of a real innovation should have a significant value for society”*

FF: *Can you give an example?*

ECW: Take the introduction of the personal computer. At first it was just a toy for hobbyists but it became an innovation when it was integrated into society. Lots of novelties are not innovations. For example, electric cars in the 1990s did not really have an impact at that time and they resulted in financial losses for the manufacturers. No one would have called them innovations then. Only recently, when they started to add value, have they become real innovations.

FF: *So, inventions only become innovations with hindsight?*

ECW: Yes, the definition is post hoc. Although we refer to the original invention as an innovation, the relationship with the subsequent applications and the value created is important.

FF: *So, an innovation is not the same as a patent?*

ECW: No, a patent just defines a new idea or approach. There are many novelties without innovation but patents – in particular patent citations – can be used as a proxy for measuring innovation. If numerous product patents cite the same core invention patent, then this was a crucial innovation.

> *“Patents can be used as a proxy for measuring innovation”*

FF: *Are there other ways to measure the value of an innovation?*

ECW: Value is by definition subjective. A significant impact on society means that the products have a large market share - they are money makers. The contribution to the gross domestic product or GDP of a country is the normal way to measure innovation. In the fields of biomedicine, pharma or medtech things are a bit different. There the impact can be determined by how many quality-adjusted-life-years or QALYs are gained by it. Of course, these industries have a way to transform that number into a monetary value.

FF: *What is necessary for a society to create value?*

ECW: There are a number of conditions. History tells us that you need prosperous countries with stable conditions. You also require infrastructure, such as production facilities and a well-educated general population.

FF: *Does this mean that wealthy and educated societies are automatically innovative?*

ECW: It is not enough on its own - the audience also needs to be receptive to the new products. If whatever you can come up with doesn’t sell, it will not become an innovation. There are various ways that an audience can be receptive. It could be a matter of slow evolution, such as the appearance of veganism that requires a shift from animal to plant-based proteins. However, it is a possible that a crisis creates a need and makes society ready for certain products. Take, for example, the COVID-19 pandemic - suddenly the mRNA vaccines that had been developed very slowly over many years got a massive boost. Climate change is another emergency that will no doubt spur innovation.

> *“If, whatever you can come up with, does not sell, it will not become an innovation”*

FF: *Is there not a contradiction between the crises and stable societies?*

ECW: World War II is a good example. During the war years Germany did not do well in terms of innovation power. In contrast, the USA had a very stable environment on the home front, which allowed the development of innovations without bombs falling all around.

FF: *Are there other important factors?*

ECW: Although not exclusively, a lot of innovations occur on the boundaries of different fields. Because of this finding, interdisciplinary collaboration has been stressed more in science and science funding in recent years.

> *“A lot of innovations occur on the boundaries of different fields”*

FF: *And money?*

ECW: Yes, the final factor is money, which of course plays an important role. It allows governments and hedge funds to focus on strategic scenarios. But because innovation is uncertain, putting all your eggs in one basket is very risky. In fact, governments cannot and should not fund every innovation. Instead, they should focus their stimulus packages on precompetitive activities, where other funds are lacking.

FF: *I guess stability, infrastructure and money are strengths of Switzerland. Are there other particular advantages in our country?*

ECW: Switzerland operates the remarkable Innosuisse program to promote science-based innovation in Swiss industry and society. Switzerland is one of the few countries that have made it a structural ongoing feature. This is more durable, less ad hoc and allows for more strategic choices. Low threshold programs such as BRIDGE and networking events, as well as larger strategic science and industry competence centers are also promising ways to tap into science for innovative transformations, as various impact studies are suggesting. However, it is still too early to detect a signal in patent citations.

FF: *How important are private investments?*

ECW: Venture capital is one way for a country to manage risk. Innovation involves uncertainty - in biotechnology for example you need to forecast what people will want or need in 20 years’ time and so investors have to take a large risk. Government can provide part of the investment but it's not its natural role and by favoring one idea over another, it may face possible conflicts of interest. Venture capital simply chooses the innovations they like, so there’s less political fallout if things fail.

Why academia and industry need to talk to each other more

CONTINUED

FF: *Where would you predict the next innovation to happen in biotech?*

ECW: One area is related to the microbiome, which is not just about yoghurts! I suspect that new products based on microbiome technology will appear. It not only affects medicine but is also important in agriculture and the environment. However, there still needs to be a broad impact discovery in that field for it to become an innovation.

> *"I suspect, new products based on microbiome technology will appear"*

FF: *How important is basic research in biotech?*

It's very important. The development time of products ranges from 10 to 25 years. At the beginning of an innovation, there is always fundamental research. For example, you can trace a direct path from COVID-19 vaccines to basic research in universities in the 1970s and 1980s.

FF: *But?*

What needs to improve is the interaction between basic research and intermediate stages of product development. The translational stages are not streamlined. It comes down to the perennial problem of how to make scientists in academia and industry talk to each other. There are no formalized ways to to do this. Also, data need to be more available. Despite being an information-based society, we are poor at sharing data and this became more apparent during the pandemic. Hopefully it provided a wake-up call.

> *"There need to be formalized ways to make scientists in academia and industry talk to each other"*

FF: *Will industry and hospitals participate?*

Clearly, the data they generate with private money belongs to the companies but if they want to make use of public data, they need to contribute and will have to come up with a compensation scheme. And as soon as hospitals see the advantages, they will be more willing to participate but especially the first ones may require incentives to do so. We need to get to the position where participation is the default position. It would suit Switzerland to take a leading role in achieving this transition.

Analysing Patent Databases

Patents in themselves are not innovation but analysis of citation networks in patent databases allows one to determine whether something should be classed as innovation. In the project "The Dynamics of Innovation: latent space modelling of patent citations" funded by the SNSF, Ernst C. Wit together with his colleague Alessandro Lomi, his post-doc Federica Bianchi and his PhD student Eduardo Filippi-Mazzola, is analyzing data from various patent offices, such as the United States Patent and Trademark Office (USPTO). This amounts to 8 million patents over 45 years, resulting in 150 million citations in total.

By looking at the citation network for example, it is possible to detect a burst of citation pointing to a small number of patents. This is indicative of emerging innovation and could act as an early detection system. Patents can also be analyzed in other ways. For example, their abstracts contain approximately 100 words and are clearly structured. By running a qualitative natural language analysis on them, the group has found that globally we may be in a phase of innovative concentration rather than expansion. The group also found that patents that are in multiple technology classes at the same time are more likely to be at the center of an innovation.

https://data.snf.ch/grants/grant/192549

High competitive impact of Swiss biotech patents amplified by extensive international cooperation

David Rees

Swiss Federal Institute of Intellectual Property |
Patent Expert

Ingrid B. Müller

Swiss Federal Institute of Intellectual Property |
Patent Expert

Switzerland has ranked first in the Global Innovation Index every year from 2011-2021. In the area of biotech patents, it has the highest market coverage and an exceptionally high technology relevance. An important factor contributing to its consistent success is the extensive cooperation and co-authorship of Swiss-based inventors with colleagues at international organizations, universities and research institutes based abroad. Such collaborations mean that Swiss-based inventors are credited on numerous high-ranking "key" biotech patents.

Assessing the impact of Switzerland's biotech IP portfolio

The marked disparity between the relatively small biotech IP portfolio originating from Swiss-based inventors and its substantially greater competitive impact*** (the product of market coverage* and technology relevance**) has been outlined in this report in recent years and is summarized in Figures 1a and 1b.

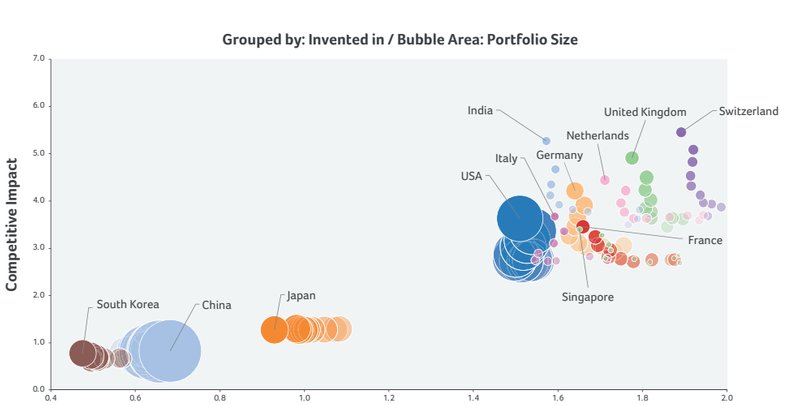


Figure 1a: Portfolio size, market coverage and competitive impact of active biotech patents by country

Fainter bubbles in the trail indicate yearly data further in the past, bolder bubbles more current developments by year

* Market coverage is an indication of the extent to which the patent has international protection scope

** Technology relevance is a measure of the citation frequency of a patent normalized for the technical area in question

*** Competitive impact is the product of technology relevance and market coverage

For biotech patents, Switzerland has the highest market coverage in the world (a measure of the number of countries for which protection has been obtained and their relative market importance). Although its portfolio size is rather modest, in line with the small size of the country, it has remarkably high technology relevance (a measure of the rate of citations of patents within a given technical area). This is shown in Figure 1b:

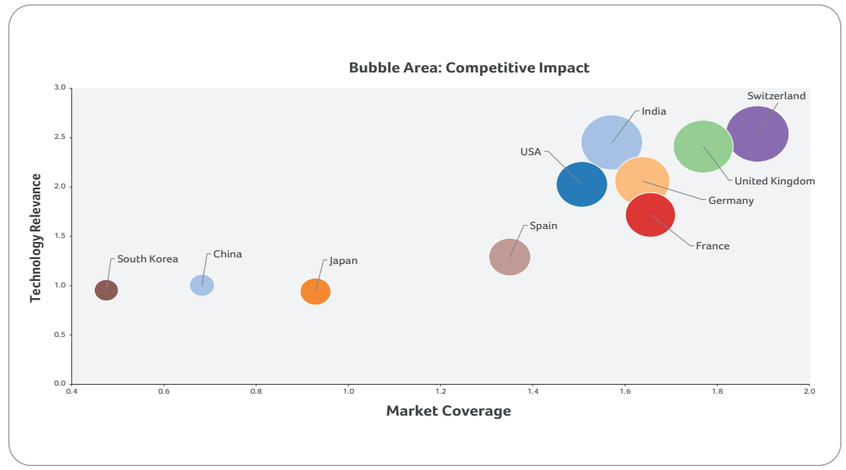


Figure 1b: Competitive impact, market coverage and technology relevance of active biotech patents by country

Developments in biotech IP over time

The biotech IP landscape for Switzerland and worldwide was examined, with patent families subdivided into 5-year segments by application year. The ratio of top-rated patents with Swiss-domiciled inventors to that of all biotech patents worldwide has risen consistently for the past 20 years. This is shown in Figure 2.

"World biotech" is high-tech/value and rates (much) better than all patented technology in general.

"Swiss biotech" is even more highly rated (up to 3.4 x world biotech in recent years) than the already highly rated world biotech."

Biotech Tagged	Active Families Publication Date				Aggregated Totals / Score
	2000-2004	2005-2009	2010-2014	2015-2019	2000-2019
Switzerland total	292	819	1,097	1,570	3,778
World total	10,047	35,437	75,028	159,175	279,687
Switzerland as percentage of world	2.9	2.32	1.7	1.0	1.4
Ratio Switzerland top decile-ranked percentage to world top decile-ranked percentage	1.7	2.2	2.8	3.4	3.0

Figure 2: Developments in biotech IP 2000-2019

High competitive impact of Swiss biotech patents amplified by extensive international cooperation

Biotech products and areas of application

A closer look at the products and areas of application of the Swiss-origin biotech patent portfolio shows that these largely mirror their worldwide counterparts, see Figures 3a and 3b. Major areas of application include: “red” biotech – pharmaceuticals/healthcare; “white” biotech – industrial manufacture; “green” biotech - plant science; “yellow” biotech – food; further applications include microfluidics and analytical techniques.

Figure 3a: World biotech patents - broad areas of application

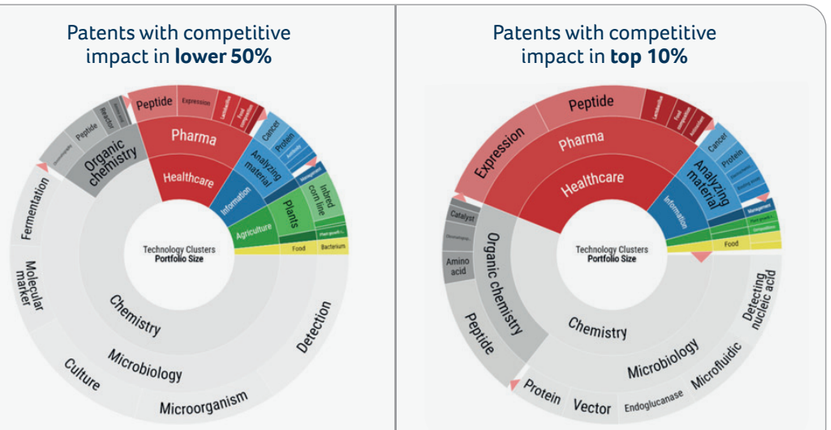
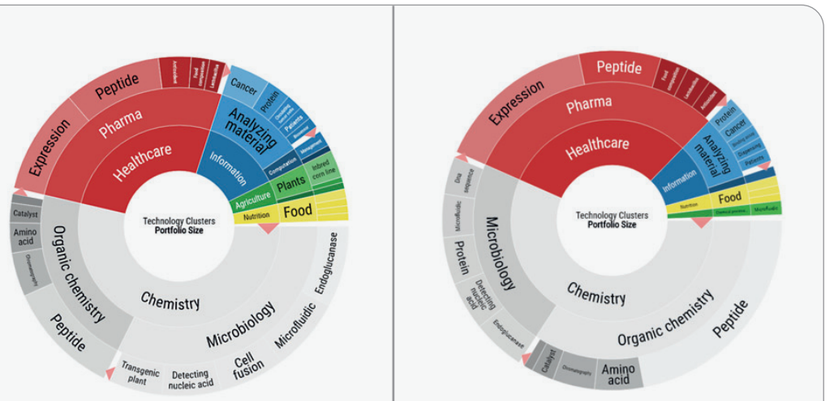


Figure 3b: Swiss biotech patents - broad areas of application



For worldwide biotech patents, the distribution shows a shift from “white” to “red” biotech comparing the lower 50% with the top 10% (top-ranked) of patents by competitive impact. For Swiss biotech patents, the shift is less marked, due in part to the fact that these are over-represented in the top 10% of patents by competitive impact, with 50% of Swiss biotech patents falling within the top 10% “world class” category.

Reasons for Switzerland’s success

The well-above average impact of biotech patents with inventors domiciled in Switzerland compares favorably with that of several larger countries, raising the question of what the reasons for this effect might be.

An analysis of the owners of biotech patents of Swiss origin reveals a distribution of players including multinational companies with a biotechnology focus (which have correspondingly large portfolios and corresponding IP asset metrics), Swiss universities/research institutes, and smaller pharmaceutical/biotech companies and startups. Patent co-ownership issues within this data set are especially illuminating. A preliminary analysis of co-owned patents, those with two or more (corporate or academic/institutional) assignees, reveals an interesting pattern of international cooperation.

Particularly noticeable are a number of extremely high-impact (“key”) biotech patents (co-)invented by authors domiciled in Switzerland, which have apparently benefited from development by and cooperation between organizations, both corporate and academic, in particular in the United States and Japan. This finding is echoed in the Global Innovation Index rankings for Switzerland which include a worldwide second place (GII 2021) in university-industry collaborations, and is a possible factor favorably influencing revenue from intellectual property (CH: worldwide 1st place in the 2021 GII).

Focusing upon the actual technical content of some of these top-rated co-owned patents reveals a veritable hall of fame of advances in biotechnology in recent years. The highest-ranking patents in biotechnology relate to CRISPR/CAS. These have not been included in the analysis, as they are “off-the-scale” in terms of impact and thus less suited as examples for a comparative study. Applications, primarily in the area of therapeutic antibodies within oncology include: multi-specific antibodies; antibodies in connection with immune checkpoint targets such as TIM-3, T-cell immunoglobulin and mucin domain 3; and PD-1, programmed cell-death protein 1; CD20 and CD22 therapies as well as chimeric antigen receptors (CAR) T-cell therapies. Schematic “impact trajectories” of selected, representative highly ranked rated patents can be seen in Figure 4.

Of note are the positive overall trends over time, with an impressive growth of the key metrics, as well as the very high competitive impact (technology relevance x market coverage) which shows end-points in the 50-200 range for these examples - far higher than the average. This is expected as a function of increased rates of citation, which are normalized for biotech area and age of application. Notable also is the change in market coverage, as grants occur in successive jurisdictions/countries or as patents lapse in certain markets over time.

Key biotech patents show high to very high impact compared with “standard” (average-rated) biotech patents and with patented technology from other fields/in general. Some significant, key-technology and extremely highly ranked biotech patents seem to have arisen from international cooperation between commercial entities and academic research institutes. This in turn has resulted in patent co-ownership between these entities. There are thus many inventors based in Switzerland who appear as authors/co-authors in several selected key biotech patents.

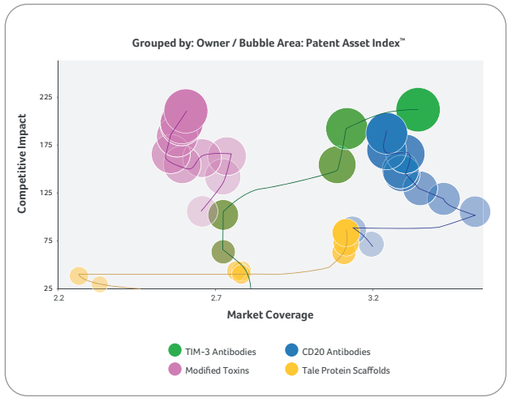


Figure 4: Schematic trajectory of selected key biotech patents with Swiss-based and international co-inventors

Note: The patent data were processed with the software PatentSight, based on patent families. A patent family condenses all patent documents relating to a specific invention, as defined by an initial priority application. Only active patent families, i.e. those in force or pending at a given point in time, are included in the evaluation. The country of origin for patents is determined via the inventor’s addresses provided in the patent applications.

Working together towards innovation that matters

Laura Suter-Dick

Biotechnet Switzerland | President
School of Life Sciences, FHNW | Professor of Cell Biology and *in vitro* Toxicology

Industrial innovation, particularly in the biotechnology sector, is under immense pressure as the ongoing pandemic poses unexpected challenges and opens exciting opportunities.

Here in Switzerland we must implement new strategies to retain our position as the world leader in innovation, while maintaining the outstanding quality of our research and products - and we need to act fast. Collaborations between research organizations and industrial partners are not new, but in current times strong ties between research organizations, SMEs and large industry are a major enabler for the timely implementation of innovative solutions.

Biotechnet Switzerland is anchored at the root of Swiss academic and clinical research, with close ties to the Swiss Biotech Association. Its member organizations provide high-quality research, modern infrastructure, and access to a fresh talent pool. Members are in an ideal position to support the private sector in progressing quickly towards successful products. Inter-organizational and interdisciplinary collaborations that bring together strong market needs, excellent business ideas, state-of-the-art research and infrastructure, and highly qualified people are key for successful innovation. With travel restrictions and disruption in supply chains, an advantage that is increasingly evident for the Swiss biotech sector is that short distances facilitate agile technology and knowledge transfer.

Strengthening networking between academic, clinical, and industrial researchers

Biotechnet Switzerland puts a major focus on enabling networking between research organizations in specific areas to ensure that they are aware of each other's needs, technological advancements, and available capabilities. High-caliber networking events promoted by Biotechnet Switzerland help players in the biotech industry look beyond the limits of their own research and promote interdisciplinarity collaboration to achieve solutions to current problems.

A few examples:

- Tissue engineering is one of the topics that Biotechnet Switzerland has continuously supported. In October 2021, the Tissue Engineering for Drug Development and Substance Testing (TEDD) annual meeting, hosted by the Zurich University of Applied Science (ZHAW), provided a fantastic forum for academics, engineers, biologists and clinicians to meet and discuss common biotechnological approaches such as bioprinting, multi-organ chips, and advanced analytical tools to support the biomedical and food industries.

- Many activities in the field of tissue engineering also occur within the Stem Cell Research in Regenerative Medicine Platform (SCRM) in Bern, with a strong focus on developing innovative therapeutic applications using cell-based therapies. SCRM has a large member-base at the University of Bern and the University Hospital Inselspital, long-standing partnerships with industry, and strong ties to other academic institutions such as the Swiss Institute for Cell Therapies (SICT).

- Similarly, Biotechnet's thematic *in vitro* diagnostics platform (TP IVD), co-chaired by CSEM and the University of Applied Sciences Western Switzerland (HES-SO), provided fertile ground for scientific exchanges at the 4th Swiss Symposium for Point-of-Care diagnostics in Davos. The symposium brought together more than 150 representatives from medicine, industry and research, working across Europe. We were honored to count Prof. Harald zur Hausen (Nobel laurate) among the renowned keynote speakers. The scientific background behind new diagnostic biomarkers, the often overlooked need for gender-specific diagnostic tools, device ergonomics and novel commercialization solutions were key topics on which participants exchanged new findings.

Accelerating drug development and personalized medicine

Advances in tissue engineering and collaboration between research organizations and industry are accelerating the development of new products in Switzerland. Initiatives to establish, characterize and apply tissue engineering for drug discovery research are now coming to fruition

- The tissue engineering group at the ZHAW has a long-standing collaboration with Novartis, funded in part by Innosuisse and Novartis. Researchers from the group have successfully developed automated cultivation and analysis of 3D-human skeletal muscle models for the investigation of potential treatments of muscle wasting diseases. The system supports translational research by employing human cells, and promotes the reduction of animal experimentation.

- Perseo pharma is a young start-up company, spun off from the School of Life Sciences (FHNW), that develops nanomedicines. Specialized in enzyme-replacement therapies, Perseo has developed an oral therapeutic to treat gastrointestinal diseases. The cell biology and and *in vitro* toxicology laboratory at the FHNW is developing, adapting and employing tailor-made *in vitro* models to evaluate the interaction of Perseo's nanomedicine with biological barriers.

- The same research group at the FHNW is applying their know-how on 3D-liver models to support research on a specific therapeutic antibody currently under development by Alentis Therapeutics, a start-up focused on the treatment of liver fibrosis. During the early discovery phase, the advanced 3D-liver culture systems developed at the FHNW are directly supporting Alentis in better characterizing their molecule with a human-relevant, scalable system.

Collaborative development between INVENesis and CSEM team

Integrating precision medicine and artificial intelligence (AI) in Switzerland and beyond

At the core of precision medicine, advanced diagnostic approaches incorporating AI play a major role in ensuring that each patient receives appropriate therapy. Members of Biotechnet Switzerland are actively supporting the implementation of AI.

- HES-SO Valais and CHUV have developed a new AI technology to label therapeutic antibodies with an imaging load in the field of theranostics. The new platform ensures that labeling does not compromise the binding of the antibody to its therapeutic target. The project is conducted within the framework of a collaboration originally supported by Innosuisse and currently financed by Debiopharm, an independent Swiss biopharmaceutical company (see Swiss Biotech Association article on Page 32 for more details).

- Another very successful example of the application of AI in diagnostics is Aktiia, a recently founded Swiss-based company providing medical technology for the diagnosis and management of hypertension. Their clinically validated Optical Blood Pressure Monitoring (OBPM) technology can estimate blood pressure accurately, automatically, and painlessly by implementing a core technology first developed at CSEM.

- In the oncology field, ovarian cancer is considered a major clinical concern with many patients presenting with poor prognosis. A Eurostars-funded consortium consisting of four companies, including the Swiss SME AnaPath Services GmbH, and two universities, including FHNW, is working on a platform to deliver personalized ovarian cancer therapy. The project exploits cutting-edge 3D cell-culturing technology and AI analytics to directly correlate the ex vivo drug sensitivity of actual tumor biopsies with clinical outcomes, enabling high-throughput, automated and accurate screening of available drugs.

Working together towards innovation that matters

CONTINUED

Supporting biomedical research through interdisciplinary collaborations

Interdisciplinary collaborations between Biotechnet Switzerland and industrial partners help to bring the most suitable expertise around the table to achieve major breakthroughs in both human and animal health.

- One example is the amazing progress in regenerative medicine pioneered by CUTISS AG, a Swiss clinical-stage life sciences company focused on skin tissue engineering. CUTISS has unveiled the denovoCast machine – the world's first automated machine to produce customized skin tissue grafts (denovoSkin©), vital for the treatment of large and deep skin injuries – such as severe burns. Developed by CSEM, the denovoCast machine automates tissue formation in a fully closed process requiring no manual intervention to ensure consistent and reproducible quality, enable parallelization, and significantly reduce production time. (More details are also provided in the Swiss Biotech Association article on P32.)

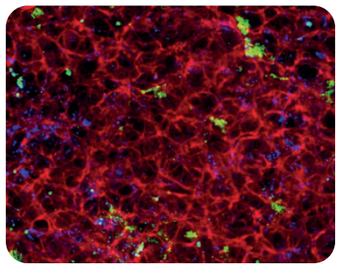
- Collaborative biomedical research also includes animal health. Parasites, especially nematodes (roundworms), can represent a significant threat to both livestock and pets. The Swiss biotech company INVENesis has teamed up with INRAE and CSEM to develop a device that allows scientists to accurately test the efficacy of different antiparasitic drugs, speeding up the discovery of new antiparasitics and cutting the cost of drug development.

- SUN bioscience, a successful spin-off from EPFL that is driving innovation in 3D-models, has also applied its advanced organoid technology. These developments are partly supported by academic collaborations, including Biotechnet Switzerland members CSEM and FHNW.

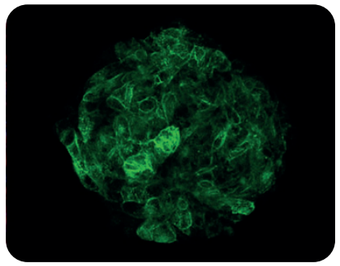
Harnessing the power of collaboration

One lesson learned from the pandemic is that we are stronger together and that distances matter. The proximity, complementary knowledge, experience, and focus of our research organizations and industry promote collaborations that propel innovation. Hence, public-private partnerships continue to play a key role in advancing biotechnology in Switzerland. In this context, Biotechnet Switzerland's members provide essential knowhow and infrastructure that enable collaborations with industrial partners and generate vital innovation.

We can make a major impact on biotechnology research by working together. So, how can we help your biotech?



Nanoparticles (green) interacting with a human cell model for nasal mucosa.



Therapeutic antibody (labelled green) penetrating a 3-dimensional human liver model and binding to its molecular target.

denovoSkin: personalised bioengineered human skin tissue

Networking

Biotechnet Switzerland: https://biotechnet.ch/
POC: https://www.pocdx.ch/
TEDD: https://www.zhaw.ch/de/lsfm/forschung/chemie-und-biotechnologie/competence-centre-tedd/
DOI: 10.1038/s42003-021-02691-0
(Matrigel 3D bioprinting of contractile human skeletal muscle models recapitulating exercise and pharmacological responses)

Examples

Cutiss project: CUTISS develops world's first machine to produce personalized human skin tissue therapy (csem.ch)

Invenesis: Innovative testing system speeds the development of antiparasitic drugs (csem.ch)

3D-Select (Eurostars): https://www.era-learn.eu/network-information/networks/eurostars-2/eurostars-cut2013off-11/3d-cell-culture-platform-for-personalized-ovarian-cancer-therapy-selection

denovoCast - World's first machine to produce personalized human skin tissue therapy

How blockchain can help to ensure the continued success of the Swiss industrial biotech sector

Hans-Peter Meyer

Swiss Academy of Engineering Sciences SATW | Head, Working Group Biotechnology

Blockchain has the potential to become a true game changer in the industrial biotech sector, providing smart contracts and interactions that automatically enforce rules and penalties.

The technology is helping the Swiss pharmaceutical-chemical industry to cooperate in exploiting new business opportunities based on mutual interests and knowhow. Blockchain could also facilitate greater collaboration between smaller players in the sector, allowing process and product development to be radically simplified and accelerated.

Switzerland leading the way in blockchain and DLT

Switzerland is one of the leading global locations for blockchain and distributed ledger technology (DLT)[1] and also importantly provides the accompanying legal framework to enable innovation in this field. (Blockchain applications are discussed further in the S-GE article on Page 38.)

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Blockchain technology first became known as a tool for cybercurrency but its utility in other sectors is now being recognized. It can provide a digital "marketplace" for bioprocess, engineering or product solutions, and allow the parties involved to feel more comfortable uploading and exchanging pre-competitive and competitive knowhow.
For this purpose, a project was started with the Blockchain Lab of the Lucerne University of Applied Sciences & Arts to develop blockchain as a decentralized database, jointly operated by industrial biotech users, that allows people to transmit information to each other in a forgery-proof and transparent manner.

The logical continuation of another trailblazing idea – the Swiss Industrial Biocatalysis Consortium (SIBC)

From drugs to vitamins, from cosmetics to colors, from pesticides to polymers, organic chemical synthesis is at the center of a huge range of everyday products. In addition, biotechnology has become an indispensable tool for enterprises using organic chemical synthesis. In 2004, six Swiss global players in the pharmaceutical chemical industry founded the SIBC to cooperate in creating new businesses using biotechnology for organic chemical synthesis[2].

At the time, the legal framework and information tools were too sluggish to achieve its objectives, but now blockchain has the potential to realize the original purpose of the SIBC to cooperate in creating new business opportunities.

Meeting the challenges of the pharmaceutical chemical industry

"Organic chemistry" has been the basis of a successful industry in Switzerland, but it faces major difficulties meeting the requirements for a sustainable future. One issue is the unacceptably high E-Factors (ratio of kg of waste per kg of manufactured product) in chemical manufacturing, which have become prohibitive with the increasing complexity of manufactured molecules. Decarbonization is another requirement driven by the CO2 price which has been drastically increased to USD 100 per ton by Swiss Re (the leading Swiss reinsurer), and is expected to reach USD 200 by 2030 (compared to the global average of USD 5). Climate change and resource overuse makes the supply of naturally sourced starting products difficult or even impossible, for example in the flavor & fragrance industry. On top of all this, consumers are increasingly asking for "green" and "organic" products, while political decision makers require sustainable industrial processes.

The pharmaceutical industry was responsible for 52% of Swiss exports in 2020, with a value of CHF 116.4 billion[3]. There are roughly 900 chemical companies in Switzerland[4] and the success of the sector is still largely due to "red biotechnology", in particular to the production of parenteral, large pharmaceutical molecules. Although these companies are able to compete on the world stage[5], and are implementing innovative sustainable technologies, there is still a lot of fragmented knowledge and knowhow that could be combined in innovative ways. We believe that blockchain can facilitate this, allowing processes and product development to be radically simplified and accelerated by collaboration between Swiss companies.

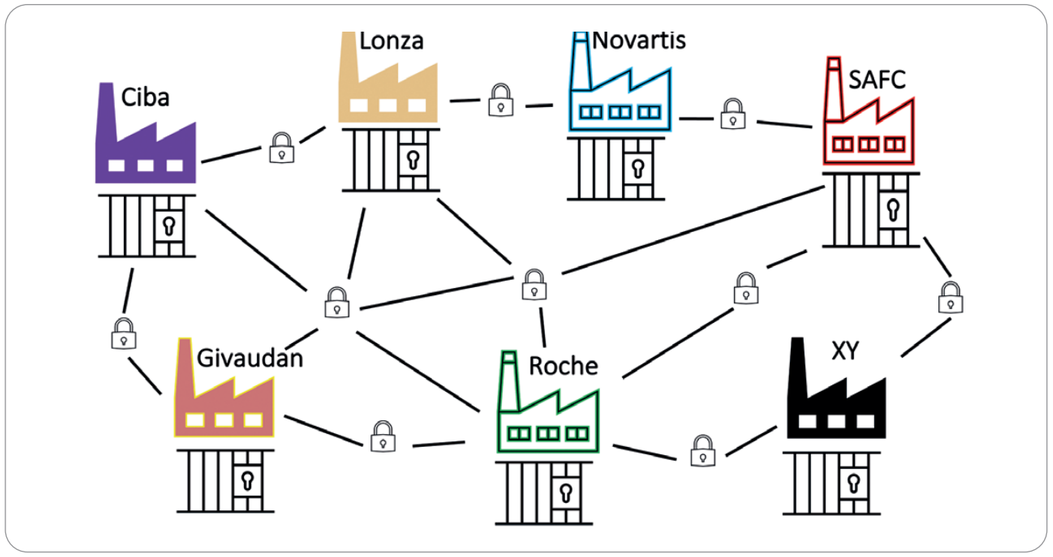

Figure 1: Blockchain has the potential to enable new forms of cooperation between companies creating new business opportunities.

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[1] Blockchain / DLT State Secretariat for International Finance SIF https://www.sif.admin.ch

[2] S. Hanlon, The Swiss Industrial Biocatalysis Consortium (SIBC): Past, Present and Future. CHIMIA (2020) 74:342-344; doi:10.2533/chimica.2020.342

[3] Swiss Biotech Report 2021. https://www.swissbiotech.org/report/

[4] H.-P. Meyer, O. Werbitzky, Development of Swiss Biotechnology Beyond the Biopharmaceutical Sector. CHIMIA (2020) 74, 345-359; doi: 10.2533/chimia.2020.345

[5] K. Hecht, H.-P. Meyer, R. Wohlgemuth, R. Buller, Biocatalysis in the Swiss Manufacturing Environment. Catalysts (2020) 10:1420-1450; doi:10.3390/catal10121420

Biotechnology drives Swiss industry innovation

Jan Lucht

scienceindustries | Head Biotechnology

In many areas of the life sciences industries, biotechnology is playing an increasingly important role in research, development and production. For the most efficient combination of ideas and resources, national and international networking and collaborations are key. Partnerships between all players – academic research institutions, startups, SMEs, and larger enterprises – have a strong tradition in Switzerland, and are important sources of innovation.

For the global healthcare industry, biotechnology has provided innovative approaches for many years. For example, five of the seven top-selling drugs worldwide are produced using biotech processes. Modern life science research has developed treatment options for severe or life-threatening diseases, and healthcare biotechnology thus contributes greatly to quality of life for many people.

Biotech approaches are becoming more relevant for industrial production of chemicals, food and feed additives, and precious flavor and fragrance molecules. They also offer opportunities for a more resource-efficient, sustainable agri-food system, through the development of new sources for food and feed compounds, and by advanced breeding of crops better adapted to future challenges. New technologies, such as genome editing, accelerate the acquisition of basic knowledge in many sectors and extend possibilities for the rapid development of improved products.

New methods and declining costs in the life sciences, along with the rapidly growing potential of computer science, artificial intelligence, data analysis, and automation, are likely to spark a true bio-revolution in the coming decades. The healthcare sector, agriculture, and even the consumer goods and energy sectors could change significantly. A study by the McKinsey Global Institute[1], based on an examination of more than 400 potential applications, estimates that over the next two decades up to USD 4 trillion in annual value could be created by biological technologies, up to 45% of all diseases could be effectively cured, and up to 60% of the world's raw materials could be produced by biotechnology.

DARPins: Novel biotech-based therapeutic agents

A case in point is the development of DARPins (Designed Ankyrin Repeat Proteins) into promising tools for therapeutic applications. DARPins are artificial proteins that can bind to a variety of antigens, just like antibodies. Because of their small size and ease of expression in microorganisms, DARPins offer important advantages over monoclonal antibodies.

The DARPin technology was conceived by scientists at the University of Zurich, and then continued to be developed by Molecular Partners following a spin-off in 2004. Initial support and funding from the Swiss government's innovation promotion agency Innosuisse allowed them to expand their research and business activities, and in 2014 the company was listed on SIX Swiss Exchange, followed in 2021 with a listing on NASDAQ. Their work focuses on the development of DARPin-based therapeutics for oncology, infectious disease, and ophthalmology. For several promising projects, they collaborate with major healthcare companies to facilitate the route to market.

In October 2020, Molecular Partners and Novartis announced a collaboration to develop, manufacture and commercialize Molecular Partner's DARP in candidate Ensovibep for COVID-19 treatment. This is a potential antiviral therapeutic designed specifically to bind to the SARS-CoV-2 virus and novel variants with high potency, thereby preventing its entry into human cells. Early in 2022, promising topline results of global clinical Phase II study showed that the risk of serious outcomes of a COVID-19 infection could be reduced by 78%. In January 2022, Novartis exercised its option to license Ensovibep and is now responsible for further development, manufacturing, distribution and commercialization activities.

> *"The collaboration between Molecular Partners and Novartis illustrates perfectly how the competencies of a small, innovative Swiss biotech company complement the extensive research resources and broad experience of a major pharmaceutical company in bringing drugs to the market."*

Such synergy will drive the further development of this innovative DARPin candidate which has global potential for helping patients in the treatment of COVID-19.

Sustainable biotech production of flavor and fragrance compounds

In the flavor and fragrance industry, biotechnology and Swiss companies also advance global innovation. In 2014, Firmenich, the world's largest privately-owned fragrance and taste company, presented CLEARWOOD®. This soft and clean version of a patchouli profile was the industry's very first large-scale fragrance ingredient produced by white biotechnology via fermentation from renewable carbon. In recent years, Firmenich has developed additional biotech fragrance compounds, further expanding their technology expertise and the sensory range of their products.

Givaudan, another global leader in the flavor and fragrance industry, in 2019 presented a new biotechnology approach for synthesizing the most widely used biodegradable fragrance ingredient, Ambrofix. Using renewable, plant-based carbon sources, it requires a hundred times less land to produce one kilogram of the new ingredient compared to the traditional production method. This is only one of Givaudan's valuable fragrance and cosmetic ingredients produced using biotechnology.

Many innovative fermentation approaches are based on renewable, readily available raw materials, and reduce the use of limited botanical resources, stabilize supply, increase resource and carbon efficiency, and result in a more sustainable production.

> *"Swiss companies are at the leading edge of the global biotechnology trend in the flavor and fragrance industry."*

Favorable framework conditions, national and global networks

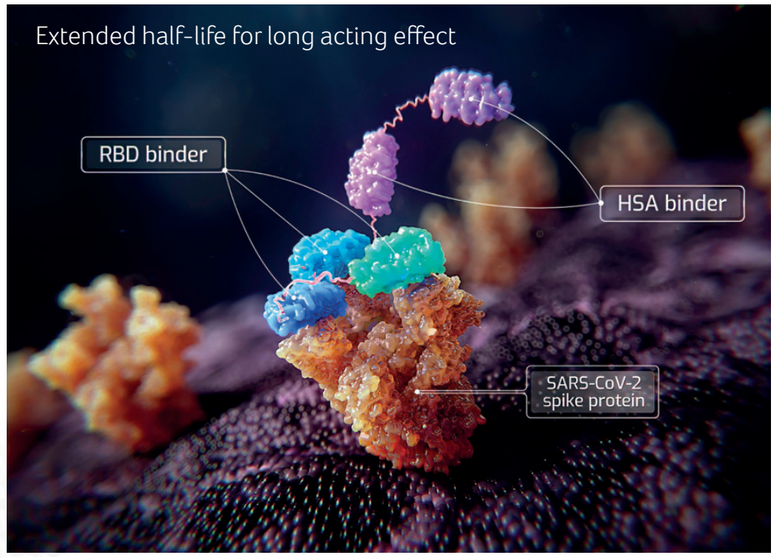
Successful innovation depends on many factors. Switzerland has an exceptionally strong innovation culture and excellent research in academia as well as in companies is backed by available funding. With expenditures of CHF 22.9 billion for R&D (2019), corresponding to 3.2% of its GDP, Switzerland invests more than most other countries. About two thirds of these financial resources come from private companies, mostly from the healthcare sector.

Promising ideas arising from basic research can be supported on their way to potential market applications by Innosuisse. Larger companies in Switzerland have sufficient resources of their own to push developments forward, and profit from global connections within their organization, but for smaller companies national and international collaborations will be crucial to their success. Many paths exist from basic research findings to practical innovations on their way to the market - the Swiss innovation ecosystem is ideally set up to facilitate this process.

References

[1] McKinsey Global Institute 2020: The Bio Revolution: Innovations transforming economies, societies, and our lives

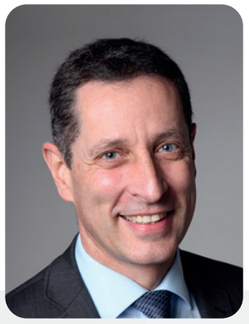
https://www.mckinsey.com/industries/life-sciences/our-insights/the-bio-revolution-innovations-transforming-economies-societies-and-our-lives



Ensovibep is a first-in-class, multi-specific DARPin (Designed Ankyrin Repeat Protein) therapeutic candidate, designed to bind to the spike protein of SARS-CoV-2 in three places to inhibit viral action.
Graphic created by Novartis

Public Private Partnerships (PPPs) - a key source of Swiss innovation

Michael Altorfer
Swiss Biotech Association | CEO



Marta Gehring
Swiss Biotech Association | Special projects

Switzerland is a liberal country, characterized by market economics and reliant on the effectiveness of the global marketplace. It shies away from applying government capital to fund startups. Nor does it intervene to build infrastructure to increase capacity or strengthen the competitiveness of a particular industry sector. Instead, Switzerland prefers to invest heavily in its leading universities and in fostering education and talent.

Collaboration and cooperation, while remaining market driven

A key part of this strategy has been the formation of public private partnerships (PPPs) which promote close collaboration between academic research groups and industrial partners. These PPPs allow partners to benefit from the complementarity of their expertise and strengths and help to turn discoveries into marketable solutions faster.

In some cases, such collaborations are focused on just one project and operate for the duration of that single purpose. Larger PPPs, however, can morph into centers of excellence that become financially independent and develop a broad scope of development activities. A prime example of this is the IOB in Basel that has developed into a world leading clinical center of excellence in ophthalmology (see below). Moreover, Swiss PPPs often include international partners, particularly in the life science field, which is not surprising given the strength and size of the sector in Switzerland.

The Swiss government's arm's length attitude to intervention

Around the globe, many countries take an "interventionist" approach, involving state funded R&D or state funds for innovative companies. Switzerland instead prioritizes a system that relies almost exclusively on the free market and the engagement of the private sector to establish a thriving startup environment. Through its innovation agency, Innosuisse, Switzerland specifically encourages the formation of PPPs, typically by providing funding for joint projects in which academic research groups and industrial partners collaborate. Innosuisse funds are paid to the academic partners to complement the investment provided by the biotech startups and SMEs. With this approach, Switzerland fosters innovation at arm's length, taking no part in the governance of the private companies and avoiding any ownership in the private sector.

A strong academic research network is essential to enable effective PPPs

Clearly, the high quality of academic research groups in Switzerland plays a central role in the development of the Swiss network of PPPs. Switzerland continues to invest heavily into the "Swiss National Science Foundation" (SNSF), its universities and university hospitals and the national innovation agency Innosuisse.

Recognizing the importance and complementary strengths of the academic research groups, the Swiss Biotech Association works with biotechnet Switzerland (see 'Working together towards innovation that matters' article, page 24). Swiss Universities, and individual academic institutions to foster collaborations in translational research. Here the objective is to apply new discoveries with a focus on developing meaningful, applicable results that directly benefit human health and advance biomedical innovation.

Benefits for both the Swiss biotechnology sector and global biomedical innovation

Switzerland's approach to foster innovation through PPPs has proven to be highly effective at strengthening translational research. Over the last three decades many private foundations, advisors, investors, and media partners have established a strong startup framework that is not only limited to biotech, but also encourages scientific scientific innovation and new business models in financial and services industries.

At the same time, Switzerland's market driven approach means that newly formed biotech companies secure funding via market mechanisms from the start. Emerging companies have to be competitive in the international realm and be attractive to foreign and domestic investors alike. The global investment and industrial community seem to recognize the value of this approach as the number of collaborations with Swiss biotech and pharma companies has been on the rise and the capital influx into Swiss biotech startups and SMEs has increased almost ten-fold during the last 10 years. At the same time, the Swiss biotech and pharma industry has become the dominant force in Swiss exports, almost tripling the export value during the last 20 years and contributing more than 40% of the country's total exports (see Page 14).

Finally, an analysis of new patent filings indicates that international collaborations and consortia typically develop higher value patents (i.e. patents with a high technological relevance and a high market potential, see 'High competitive impact of Swiss biotech patents amplified by extensive international cooperation' article Page 20). Equally, the global community has been successfully sharing scientific know-how which which has in turn led to the development of new products (see COVID-19 vaccines and therapies and many other examples).

PPPs come in many shapes and forms - from early-stage research projects all the way to fully developed clinical centers of excellence

The four examples below serve as showcases to demonstrate the diversity and respective benefits of Swiss PPPs for both the public and private partners. In all four cases the main funding does not come from the government agency Innosuisse, but from private individuals or pharma companies. This is in line with the Swiss government's approach of investing heavily in the academic rather than the commercial side of PPPs.

1. **Debiopharm's** "IDEAL initiative", Lausanne

IDEAL INNOVATION DEBIOPHARM ACADEMIA LEMAN

The catalyst

Given Switzerland's flourishing ecosystem of public institutions, universities, hospitals, and developers, Debiopharm was looking to source more locally generated innovation (see 'Working together towards innovation that matters' article, Page 24).

Debiopharm is a private biopharma company whose main activities include drug development, drug manufacturing and digital health investment.

Objective

Reinforce collaboration between Debiopharm and Swiss university research centers to accelerate the pathway from early scientific innovation to clinical development.

Development stage and therapy areas

Discovery stage compounds in oncology and bacterial infections.

Reference

https://www.debiopharm.com/drug-development/press-releases/debiopharm-launches-the-ideal-initiative-to-strengthen-the-lemanic-region-as-a-hub-for-life-science-innvovation/

Private sector benefit

First sight of locally generated innovations for potential entry into the company's expanding pipeline.

Public sector benefit

Opportunity for academia to accelerate research project output via Debiopharm's expert development advice combined with financial support. In 2021 for example, Debiopharm's signed a collaboration agreement with the University of Geneva's School of Pharmaceutical Sciences.

Public Private Partnerships (PPPs) - a key source of Swiss innovation

2. The Wyss Center Geneva and Zurich

Wyss Zurich
Translating
Science into Life

The catalyst

According to the Wyss Center, "interdisciplinary teams unite the best of academia and industry".

The Wyss Center in Geneva is a not-for-profit neurotechnology research foundation, while the Wyss Center in Zurich is the joint translational research accelerator of the University of Zurich and the Swiss Federal Institute of Technology Zurich (ETH). Both were made possible by a generous donation from the Swiss entrepreneur and philanthropist Dr. Hansjörg Wyss,

Objective

Advance understanding of the brain to drive development of transformative bio- and neurotechnologies.

Development stage and therapy areas

Basic and applied research in neurobiology, neuroimaging and neurotechnology in epilepsy, stroke, Alzheimer's disease, and dementia.

Reference

https://wysscenter.ch/approach
https://www.wysszurich.uzh.ch/

Private sector benefit

The Wyss Center acts as a PPP accelerator and has established "academic and clinical collaboration" and "translational team" units responsible for cooperating with faculties, clinicians, research centers and hospitals in Switzerland and beyond. Advanced projects have already spun out as independent companies and others are preparing for that step.

Public sector benefit

Access to the Wyss Center's teams to support efficient translation of technologies to the clinic. The Wyss provides crucial input on protocol development, clinical trial management, regulatory affairs, quality assurance, business development, intellectual property management and entrepreneurship.

3. Institute of Molecular and Clinical Ophthalmology (IOB), Basel

IOB Institute of Molecular and Clinical Ophthalmology Basel

The catalyst

The IOB institute was established in 2018 with an understanding that ophthalmic researchers and clinicians need closer collaboration to generate ground-breaking innovation. Given its constitution as a foundation, the IOB institute grants academic freedom to its scientists.

Objective

Encouraging basic researchers and clinicians to work hand in hand in advancing the understanding of vision and its diseases mechanisms to develop new therapies for vision loss.

Development stage and therapy areas

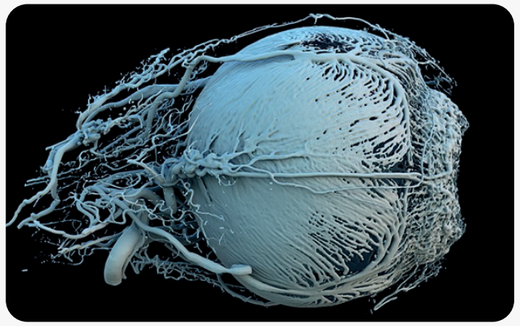
Ophthalmology, with a focus on early stage macular degeneration, glaucoma, and myopia treatments.

Private sector benefit

Access to 11 study groups (6 in the molecular and 5 in the clinical study group) and 6 platforms covering genetics, imaging, translational research, myopia, and genetic epidemiology of ophthalmic diseases, visual neurophysiology, and significantly, a clinical trial centre platform.

Public sector benefit

The institute benefitted from CHF 20 million in funding in 2021 alone and has facilitated collaboration with industry, including with Novartis and Roche in Basel and Beam Therapeutics in Boston, Massachusetts, USA among others.



Reference

Founding partners: https://iob.ch/partnering-institutions

4. Balgrist Campus, Zurich

Balgrist
Universitätsklinik

The catalyst

Since 1909, the Balgrist University Hospital has worked in collaboration with the University of Zurich, providing training for doctors in all areas of musculoskeletal health. The next step was to extend the collaboration with industry and the Swiss Federal Institute of Technology in Zürich (ETH).

The Balgrist University Hospital is a private non-profit institution "managed according to economic principles" and entirely focussed on offering cutting-edge orthopaedic medicine and first-class treatment of musculoskeletal disorders.

The Swiss Federal Institute of Technology in Zürich (ETH) is a public research university, consistently ranked among the top 1-5 universities in Europe, and among the top 3-10 best universities in the world.

Objective

The creation of a campus location for researchers, medical practitioners, developers, and industry to work together on musculoskeletal health, spearheaded by the Balgrist University Hospital and ETH in Zurich.

Development stage and therapy areas

Musculoskeletal health including orthopaedics, radiology, anaesthesiology, rheumatology, physical medicine and chiropractic.

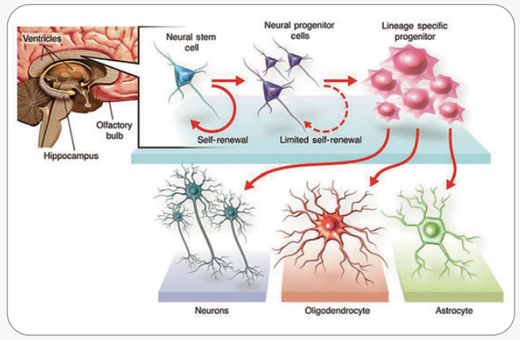
Private sector benefit

Access to cutting edge engineering (ETH) and biomedical research (Balgrist and University of Zurich), providing an opportunity for first sight of locally generated innovations with a compelling market potential.

Public sector benefit

Balgrist Campus brings together medical practitioners, researchers, and industry working on human musculoskeletal system, combining the efforts of three key entities:

- University of Zurich
- The Swiss Federal Institute of Technology in Zürich (ETH)
- The Balgrist University Hospital



Reference

https://www.balgrist.ch/en/research/research-units/research-paraplegia/research-projects/

Already a key pillar

In conclusion, Swiss PPPs have already fully demonstrated their ability to foster the rapid application of translational research in an industrial setting. They have helped to advance the development of new platform technologies and distinct therapies and diagnostics alike across a broad range of therapeutic areas. Academic research is strengthened with a focus on addressing unmet medical needs, while private corporations can accelerate innovative projects with external support at lower cost.

Whether it is spin-outs from universities, new ventures established by biotech investors, spin-offs from large pharma companies or simply companies that move to Switzerland to benefit from its excellent framework and networks, all ecosystem participants have access to this innovation hub and government support through the PPP approach. The diversity and effectiveness of PPPs have thus become a key source of Swiss biomedical innovation.

Sparks provides a welcome springboard for biotech SMEs on SIX Swiss Exchange

Fabian Gerber

SIX Swiss Exchange AG | Senior Relationship Manager Primary Markets

The new SME stock exchange Sparks, launched on 1 October 2021, is helping promising biotech companies accelerate their growth and take their businesses to the next level on SIX Swiss Exchange.

Investments in biotech companies break new records

In 2021, biotech companies listed on SIX Swiss Exchange raised around CHF 200 million in follow-on equity capital transactions. Even though the sums raised are much less than what was accumulated in 2020, they are more evenly distributed across the various companies and, when considered over a period of five years, they are broadly in line with the average . This consistency, even in turbulent times, underscores the Swiss capital market's remarkable ability to satisfy the funding needs of biotech companies.

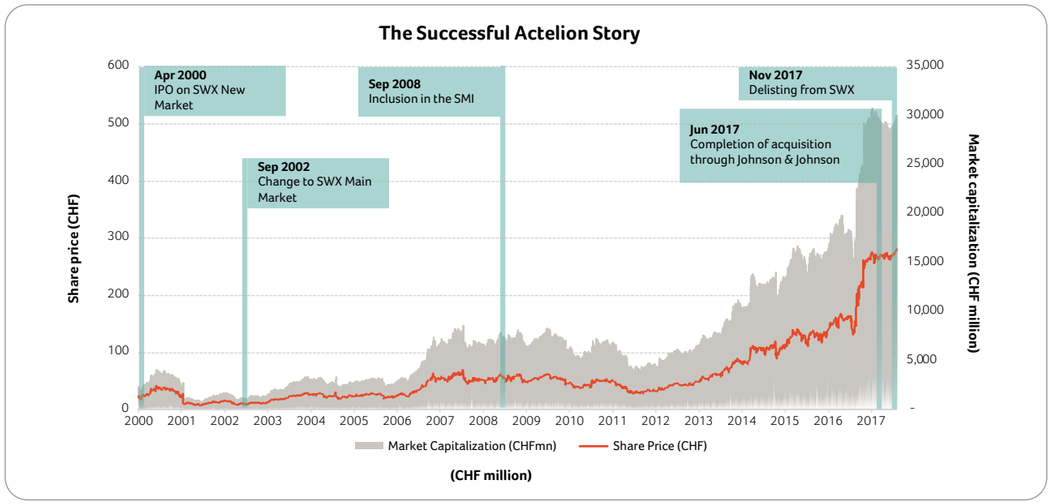
The biotech sector has also proven to be attractive for venture capital, and investments have, with the exception of 2018, been steadily on the rise over the last few years, reaching new record levels in 2020. This increase in funding has meant more biotech SMEs are maturing to the point at which they can consider an IPO.

Historically, biotech IPOs in Switzerland have taken place at a relatively late stage, e.g. aiming to raise more than CHF 100 million on valuations of around CHF 500 million, and companies considering an IPO earlier have had to look outside Switzerland. Sparks aims to change this by providing the missing link in the financing ecosystem, offering biotechs an earlier route to market, and VCs earlier exit options. The ambition is also to attract companies in earlier stages of development from outside Switzerland.

Enabling the full growth advantages that public markets can offer

A properly functioning public SME capital market is of great importance for Switzerland, and fast-growing SMEs that are primarily financed by private investment are likely to seek a "liquidity event" (a sale to new owners or a listing on a stock exchange) combined with raising growth capital. The introduction of Sparks aims to facilitate access for (fast-growing) SMEs to the public capital markets and to allow more SMEs to enjoy the full benefits that public markets offer.

In the biotech space, this will create the basic conditions for new Swiss biotech success stories, similar to those that we saw around the turn of the millennium on the equity segment SWX New Markets. Actelion, among others, was initially listed at that time and in less than three years it grew from a startup company into a global biopharmaceutical company, completing the transition to the SWX Main Market Board in September 2002, six years before making the leap onto the SMI. This success story led to a USD 30 billion takeover bid by Johnson & Johnson in 2017:



Source: SIX Swiss Exchange

'There is huge potential for more success stories, especially from Switzerland's vibrant life sciences ecosystem with its large number of exciting and innovative companies. Sparks enables these companies to efficiently generate growth capital and take their company to the next level by further expansion domestically and internationally. This ultimately benefits the entire Swiss economy, as it supports the creation and preservation of jobs and expertise in our country.

The segment is also open to foreign companies that want to tap into the Swiss capital market and benefit from Europe's leading exchange for life science companies.

A brilliant start

With its stellar stock market debut on 11 February 2022, the Swiss portfolio company Xlife Sciences, which is specialized in the value development and commercialization of promising early-stage research projects from universities and other research institutions in the healthcare sector, became the first company to list on Sparks. The change from the open market ("Freiverkehr") in Munich to a regulated market in Switzerland allows the company to make itself more accessible to institutional investors, increase the shares' liquidity and further raise its profile. This first listing on Sparks marks the beginning of a new era which should encourage other companies to follow the same path and benefit from the various advantages that Sparks can offer them.

The benefits of public markets that SMEs can access through Sparks

Sparks provides fast growing, capital seeking SMEs in Switzerland with access to the equity public markets and a springboard to take their business to the next level by:

- offering faster and more efficient capital raising opportunities by providing access to new sources of capital that have proven robust throughout varying economic conditions
- enabling SMEs to configure an optimal, diversified and resilient financing structure
- enhancing SMEs' visibility with investors through better publicity and news coverage
- allowing SMEs to further expand or diversify their shareholder structure
- strengthening SMEs' brands and trustworthiness towards clients, business partners and employees
- securing for SME shareholders the protection offered by the Swiss takeover rules

Sparks' listing requirements and trading hours are tailored for SMEs, as illustrated in the following table:

Requirement	SIX Main Market	Sparks (SME Segment)
Track Record	> 3 years (possibility of exemption)	> 2 years (possibility of exemption)
Equity-capital requirement	> CHF 25 million	> CHF 12 million
Capital-increase requirement	-	> CHF 8 million (none if equity capital > CHF 25 million)
Max. market capitalization at listing	-	< CHF 500 million
Max. market capitalization post listing	-	< CHF 1 billion (transfer to SIX main market if average over 12-month period is higher)
Freely tradable shares (out of the outstanding shares)	> 20%	> 15%
Market capitalization of freely tradable shares	> CHF 25 million	> CHF 15 million
Min. number of investors	-	> 50 investors
Trading hours	▪ Opening auction at 9 am ▪ Continuous trading until 5.20 pm ▪ Closing auction and TAL until 5.40 pm	▪ Opening auction at 3 pm ▪ Continuous trading until 5.20 pm ▪ Closing auction and TAL until 5.40 pm

In contrast to the SME growth markets in the EU, the revised SIX Swiss Exchange's regulations enable SMEs to list their shares (not only to seek admission to trading at a multilateral trading facility) and thus to benefit from the advantages of a listing status, including more investment flexibility for the institutional investors' universe.

With the new trading model, that has been optimized for shares of companies with smaller market capitalizations, investors will additionally benefit from enhanced price finding and execution of trades.

Sparks provides a welcome springboard for biotech SMEs on SIX Swiss Exchange

CONTINUED

Building up an ecosystem

As a financial market infrastructure provider, SIX Swiss Exchange accepts its responsibility to take on the role of orchestrator in the development of various initiatives and services around Sparks. It will be crucial for the new Sparks equity segment to be part of a vibrant ecosystem, and its success will strongly depend on the contributions of capital market participants.

The ecosystem development efforts of SIX Swiss Exchange focus on extending initiatives that have already been established and proven in the main market such as Stage – a program featuring Baader Helvea, UBS, Zürcher Kantonalbank and Finanz und Wirtschaft, which increases the visibility of SMEs among capital market stakeholders through services such as research coverage and factsheet creation – and Bridge, a platform which offers a consolidated calendar aggregating corporate events across issuers as well as access to issuers.

It also offers a digital catalog which provide an overview of services and providers available in the Swiss capital market to make the listing process easier, plus several new educational offerings such as an e-learning platform that prepares potential IPO candidates for the associated reporting obligations once listed.

Sparks IPO Academy

This exclusive fast-track six month program is designed to help executives of promising fast-growing SMEs prepare for a potential IPO on SIX Swiss Exchange's Sparks segment. It has been jointly developed with several leading capital market specialists in Switzerland.

1 Source: SIX Swiss Exchange. The sample group includes: Addex, Basilea, Evolva, Idorsia, Kuros Biosciences, Molecular Partners, Newron Pharma, ObsEva, Polyphor, Relief Therapeutics, Santhera Pharmaceuticals.
2 Excluding the year 2020.
3 Source: Swiss Venture Capital Report 2021.
4 According to the new Swiss prospectus regime, listed companies can issue new shares for up to 20% of the already outstanding share capital each year without having to issue a prospectus.
5 A Swiss incorporated company being primary listed on a foreign exchange may be vulnerable to unsolicited takeovers. With a primary listing in Switzerland and a regulated market like Sparks, the company secures for its shareholders the protection offered by the Swiss takeover rules.

One of the two biotech companies participating in the first class of the Sparks IPO Academy 2021/22 is Securecell AG. Michele Bomio, CFO of Securecell AG, shares his experiences of the Sparks IPO Academy.

What prompted you to look into a possible IPO for your company?

The topic of an IPO is something we have been looking at for quite some time. As entrepreneurs we felt it was important at an early development stage to explore all possible options and improve the company's IPO readiness. I have previously gone through the IPO process and I can say with absolute conviction that it makes your company stronger, even if you do not end up going public. The Sparks Academy should therefore not only be seen through the lens of helping us in assessing whether going public is the right and feasible next step, but also as potentially strengthening our business.

What was the deciding factor for you to participate in the Sparks IPO Academy and what is your experience so far?

We found the topics, the structure and also the experts to be very high quality. We consider the knowledge building, the networking with these experts and the interaction with peers to be very valuable. When we heard that we had been selected as one of the 13 firms for the first cohort, we felt very honored. The training sessions we have attended so far support my initial statement and we have not been disappointed. Furthermore, the online modules can be easily combined with our busy schedules.

For which companies is the program suitable?

An IPO is often seen as the cherry on the cake in the life cycle of a company, but this does not have to be the case, and the new equity segment Sparks could be an interesting option on the way. However, in order to be accepted for the program, the company must already have a certain maturity and IPO readiness. In my opinion, an IPO should be a realistic option in a short-mid-term horizon (i.e. in the next 24months) in addition to the listing requirements for Sparks.

Why Switzerland's pioneering role in blockchain combined with its biotech heritage makes it a source of innovation

Sirpa Tsimal

Switzerland Global Enterprise | Director Investment Promotion

With the rise of new technologies such as blockchain and AI, the pragmatic regulatory approach of the Swiss authorities has become an important asset. Swiss laws, unlike those in many other countries, are formulated in a technology-neutral way, which means that companies implementing novel business models and emerging technologies can operate within existing law and enjoy legal certainty. This progressive regulatory environment laid the foundation for the now famous Swiss "Crypto Valley".

It all started with a few pioneering crypto entrepreneurs who were looking for a jurisdiction that would allow them to experiment with a new technology – blockchain. Their success attracted like-minded companies, and soon Switzerland's Crypto Valley had established a worldwide reputation as a catalyst for new blockchain business ventures with a variety of new applications that go far beyond the finance sector.

In the life science industry, Switzerland's longstanding expertise has produced a strong ecosystem across the entire value chain that has always been attractive to biotech companies. Sources of innovation in this sector increasingly stem from other business models, in particular through the application of processes, databases and data analytics that allow the smart application of therapies or selection of patient groups. This allows more effective and targeted therapies for personalized medicine and more focused drug development. In the following section, the enormous potential of blockchain in the development and funding of healthcare applications is discussed by industry experts.

Voices from industry

Dr. Galia Kondova

University of Applied Sciences and Arts Northwestern Switzerland (FHNW)

As a member of the Focus Healthcare Team at the School of Business, I conduct research in the area of blockchain applications in healthcare with a focus on self-sovereign identity (SSI). I most recently drafted a use case on the PharmaLedger's blockchain-enabled electronic product information (ePI) platform that was submitted to the International Organization for Standardization (ISO).

Switzerland was one of the first countries in the world to adopt a legislative framework that facilitates blockchain-based applications in different areas including healthcare. Personally, I believe the greatest potential of blockchain lies in the development of national as well as international platforms for secure and trusted data access management among stakeholders within ecosystems in the healthcare sector. Projects like the PharmaLedger and MedTech Blockchain platforms in Switzerland are promising initiatives in this respect. In addition, the Swiss Blockchain Federation along with the Crypto Valley maintains a database of innovative blockchain companies in Switzerland including in the healthcare sector.

Paul Kohlhaas

Co-Founder and CEO of Molecule

Molecule is a platform that works to decentralize drug development by positing an alternative or complement to the conventional pharmaceutical funding and R&D model. This alternative is realized by a marketplace, known as Molecule Discovery, that moves early-stage intellectual property into web3 through the IP-NFT - a specific Non Fungible Token pioneered by Molecule. This is coupled with frameworks to build biotech decentralized autonomous organizations or DAOs (such as VitaDAO) and communities which come together to fund research in specific therapeutic areas. These communities consist of patients, researchers, and enthusiasts. Simply put, Molecule, through its DAOs, accelerates the discovery and funding of early-stage therapeutics.

Committed to the foundation of decentralized, collaborative and open-source drug development, Molecule is embracing Switzerland. The advantages of incorporating in Switzerland extend past its centrally located presence in Europe, especially for blockchain companies. Molecule is one such company and has taken advantage of what Switzerland has to offer: from a pharmaceutical perspective, a robust and ever-growing biopharma network; and from a legal perspective, progressiveness and vital security.

Jon Abela

Co-founder and CEO of D36

At D36.ch, our objective is to act as a vector to enable players in the healthcare market to use digital technology to deploy solutions leading to personalized medicine. The healthcare of the future is P4 medicine (medicine that is predictive, preventive, personalized and participatory) and we believe Switzerland has the potential to be one of the driving forces for this revolution in healthcare. Switzerland not only has leading medical institutions and major pharma companies, but innovation led by biotech and medtech SME's, as well as the large private insurance companies engaging in digital offerings for their customers and potential patients.

We have partnered with Intellias (https://d36.intellias.healthcare/) in our ambition to deliver software solutions to the industry with access to top engineering talent and experience.

One of the major hurdles to deploying P4 medicine is related to security concerns and data privacy. This can be addressed by applying blockchain solutions that act as immutable notary ledgers ensuring compliance and responsibility from all participants in the exchange of this information. Anonymity allows data from different institutions to be collected and large-scale models to be run, benefiting scientific research developing targeted therapies. This impossibility of linking personal information to the data for these studies is based on a 'trustless' system that enables collaboration between different healthcare providers to run big data analysis and develop machine learning models. By combinations of on-chain and off-chain data storage, solutions can be designed to link data to patients for authorities in case of need and to abide by state/industry regulations.

Jonathan Llamas,

Co-Founder Verum Capital

Verum Capital AG, a Web3 venture builder, is working with RoxPharm, a technology-focused company, to fully capitalize on blockchain's capabilities, including the increased security that comes with self-custody and the increased returns that are seen with Decentralized Finance(DeFi).

This collaboration is helping to connect the pharmaceutical and life sciences sector with the blockchain space to create new opportunities for investors. In 2022, RoxPharm will focus on using blockchain technology to fractionalize royalty deals, making them accessible to new types of investors and enabling alternative financing for pharmaceutical companies.

According to RoxPharm CEO, David Klingenbeck: "Currently, direct investment into license deals is only feasible for a small selection of players - pharmaceutical companies or specialized investment companies. We want to make them available to all investors, including retail investors."

Marco Cuomo

Applied Technology Innovation Manager at Novartis and PharmaLedger Lead-Architect

Dan Fritz

Supply Chain Domain Architect at Novartis and PharmaLedger Industry Lead

PharmaLedger is a 36-month project that brings together 12 global pharmaceutical companies and 17 public and private entities, including technical, legal, regulatory, academia, research, and patient representative organizations. The goal of the project is to provide a widely trusted platform that supports the design and adoption of blockchain-enabled healthcare solutions while accelerating delivery of innovation that benefits the entire ecosystem, from manufacturers to patients. As part of Pharmaledger, eight use cases have been developed to showcase the huge potential.

The idea behind PharmaLedger was sparked in late 2017 during a conference in Switzerland. Crypto Valley with all the innovative and creative startups, the various universities with blockchain centers of excellence and the strong community around blockchain topics in Switzerland is a key element to create and foster ideas and bring them to life. Not only at the beginning of our journey with PharmaLedger, but especially during the ups and downs of such a huge undertaking, it was and still is extremely helpful to tap into such a large and diverse pool of experts to discuss and solve problems.

PharmaLedger as a project comes to an end in 2022 and prepares for sustainability and exploitation of the future potential. The Blockchain network in Switzerland and across the world is very inspiring to think about new ways of governance between classic and completely decentralized approaches. We can learn from others, but we can also give back a lot. This is what makes it so exciting.

About the Swiss Biotech Success Stories

Swiss Biotech Success Stories demonstrate the power and potential of Swiss biotech

Switzerland is one of the world's leading biotech hubs and attracts many foreign companies, specialists and investors. It provides over 50,000 jobs and, together with the pharmaceutical industry, accounts for over 40% of Swiss exports.

To make the industry's impact more visible, the Swiss Biotech Success Stories initiative was launched in 2018. Selected success stories are showcased to illustrate how Swiss biotech companies help patients, improve health care worldwide, and make a valuable and significant contribution to the Swiss and global economy.

Laureates are individuals or groups who have earned extraordinary merits. Success is broadly defined as scientific, translational, medical or commercial, together with other aspects that have a positive impact on the biotech and life science industry and society in Switzerland.

"It is essential to share with the public the importance and success factors of biotech companies and to ensure that decision makers understand what it takes for the industry to develop and remain competitive,"

says Michael Altorfer, CEO of the Swiss Biotech Association.

"At the same time, young talent should be inspired and motivated to take a closer look at the great variety of career profiles in biotech. As a successful and booming economic sector, the biotech industry depends on many passionate, visionary and well-trained up-and-coming talent."

Independent jury of experts

Luca Bolliger
President of the jury
Vice President Swiss Biotech Association

Patrick Aebischer
President Emeritus EPFL
Serial Entrepreneur

Stefanie Flückiger-Mangual
CEO and Co-Founder
Tolremo

Gabrielle Gache
President Swiss Healthcare Licensing Group

Ulrich Geilinger
Co-Founder and Senior Partner, HBM Partners

Seraina Gross
Journalist Handelszeitung

Daniela Marino
CEO and Co-Founder Cutiss

Jürg Zürcher
Expert and EY senior advisor in the biotech field

Thomas Staffelbach
Secretary of the jury
TS Kommunikation

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Swiss Biotech Association

Award winners 2019

Biogen

Headquartered in Zug, Biogen has been a key stimulus and model for the biotech industry. Its best-selling drug against multiple sclerosis or its latest Alzheimer's candidate, as well as the new production facilities in Luterbach, creating 600 new jobs, are proof of Biogen's success.

GLYCART biotechnology

The Schlieren-based company has been an integral part of Roche Pharmaceutical Research and Early Development since 2005 and is a pioneer in antibody engineering in cancer immunotherapy. Its antibody glycosylation technology increases immune-mediated killing of cancer cells and builds the basis for improved cancer medicines.

okairos
from genes to vaccines

Fully integrated into GlaxoSmithKline since 2013, Okairos from Basel developed innovative T-cell based vaccines for major infectious diseases such as malaria, hepatitis C, HIV, and Ebola. Its novel replication-incompetent adenovirus vectors could enable the development of important new vaccines and offer immunizations against illnesses that lack vaccines.

SELEXIS®

The advanced technologies in protein expression by Selexis provide biotech and pharmaceutical companies with a rapid, stable, and cost-effective solution for the production of recombinant proteins. Nearly a hundred drug candidates in clinical development and three commercial products utilize the technologies of the Plan-les-Ouates-based company.

VIFOR FRESENIUS MEDICAL CARE RENAL PHARMA

This transformational joint venture provides Vifor Pharma direct access to dialysis patients, facilitating the product distribution and recruitment for clinical development. It transformed the company from Glattbrugg rapidly into a global nephrology corporation. Such vertical integration is a role model for the convergence of different life science sectors.

Award winners 2020

Headquartered in Allschwil, Actelion is part of the Johnson & Johnson Family of Companies. Its ground-breaking research and medicines have been a key contributor to improve the lives of people affected by pulmonary hypertension, and have made Actelion an industry leader in this area.

Family-owned Debiopharm from Lausanne, identifies high-potential compounds in oncology and for the treatment of bacterial infections. They are tested in clinical development and licensed to business partners globally. Over a million patients benefit from their therapies every year.

Helsinn, an important employer in Ticino, has a broad portfolio of marketed cancer care products and a deep development pipeline. It has built significant R&D and manufacturing capacities, and also advances patient care and supports healthcare innovation with its investment fund.

The trio of foundations has been supporting biotech startups with great success for more than 10 years, thereby making a significant contribution to the growth of the Swiss biotech industry. They share the nomination for the Swiss Biotech Success Stories Award.

Werner Arber, the Swiss microbiologist and geneticist won the 1978 Nobel Prize in Physiology or Medicine for his discovery of restriction endonucleases. His groundbreaking research in the field of molecular genetics was instrumental in the development of biotechnology.

Award winners 2021

Bachem is a leading manufacturer of peptides and oligonucleotides. The company has grown over 50% in the last five years and now offers more than 5,500 different biologically active peptides amino acid derivatives and oligonucleotides. Its investment plans call for the investment of over USD 400M to continue to pursue its growth strategy.

Basilea Pharmaceutica is a leader in targeted oncology small molecules, novel antibiotics and antifungals. Since its listing in 2004 (SIX: BSLN), Basilea has launched two anti-infective treatments: Cresemba (isavuconazole) for invasive fungal infections and Zevtera (ceftobiprole), an antibiotic for severe hospital bacterial infections.

ESBATech, now a Novartis company, is recognized for its pioneering role in developing single-chain antibody fragments for ophthalmic indications. The most advanced product from the ESBATech platform received marked approval by the FDA in October 2019 and shortly thereafter in all major markets.

Lonza is a global leader in contract development and manufacturing services with strong R&D capabilities and world-class facilities across five continents. In 2020, Lonza supported more than 820 pre-clinical and clinical small and large molecules, more than 245 commercial small and large molecules and produced 230 billion capsules.

Founded by the renowned immunologist, Professor Bernard Mach MD PhD, privately-owned Novimmune is a leading light in the discovery and development of fully-human, antibody-based drugs used to fight autoimmune and inflammatory diseases and cancer.

Find more info at swissbiotech.org/success-stories

Swiss Biotech Success Stories award winner 2022
Genedata

Genedata is the leading global provider of enterprise software solutions that digitalize data-rich and complex biopharmaceutical R&D processes to enable AI approaches for precision medicines.

Incorporating extensive biopharma R&D domain knowledge, Genedata software helps biopharmaceutical organizations optimize workflows, increase research automation, improve experimental data quality, and maximize ROI in R&D expenditure.

Founded in 1997 by Othmar Pfannes, Ph.D., Genedata is privately owned and headquartered in Basel, Switzerland. Sustained organic growth and a strong commitment to its employees are the cornerstones of Genedata's 25-year history.

With more than 300 employees and offices strategically located throughout Europe, the USA, and Asia, Genedata works closely with leading biopharma and biotech companies around the world. Today, over 200 companies rely on the Genedata Biopharma platform, including all top-25 biopharma companies worldwide, making it the global market leader.

By digitalizing biopharmaceutical R&D processes, the Genedata Biopharma Platform is enabling an R&D revolution driven by precision medicines and artificial intelligence approaches. This will help the industry to deliver innovative biotherapeutics, vaccines and cell & gene therapies to patients more quickly.

"Digitalizing R&D processes will be the key for the future success of the biopharma industry, as it is the foundation for accelerating the delivery of personalized precision medicines. Genedata has become the global market leader in this area based on providing products of the highest quality and our deep understanding of science - qualities that are rooted in our Swiss heritage. Of course, our success would not have been possible without the amazing teams based in our offices around the world, and I am delighted to receive this award on behalf of all Genedata employees"

Othmar Pfannes, CEO & Founder

Swiss Biotech Success Stories award winner 2022
Etienne Jornod

Etienne Jornod has been the Executive Chairman and Co-Owner of OM Pharma since October 2020.

Mr Jornod looks back at over 25 years of entrepreneurial achievements starting by transforming the Swiss drug wholesaler Galenica into Vifor Pharma. The key to this success was recognizing the importance of iron in oxygen transport and turning a 30-year-old product (iron sucrose) into an injectable medication containing small doses of iron that could be delivered along with erythropoietin to treat anemia in patients with chronic kidney disease.

This advancement paved the way for development of ferric carboxymaltose, a novel iron complex that consists of a ferric hydroxide core stabilized by a carbohydrate shell, that allows for controlled delivery of iron to target tissues throughout the body.

Etienne Jornod and the Vifor Pharma team further expanded the success of this company thanks to a joint venture with Fresenius-FMC, the largest global network of dialysis centers, creating Vifor FMC Renal Pharma. This joint venture enabled, among others, the launch of Mircera® (methoxy polyethylene glycol-epoetin beta) in the US in partnership with Roche. Within weeks, Mircera® achieved annual sales of over CHF 500 million in the US and is currently supplied to over 3,500 dialysis clinics in the US and its territories.

In his new position, Etienne Jornod is committed to advancing the "New OM Pharma" to become a highly innovative and research-based enterprise. The transformation will include new research aimed at extending the use of bacterial lysates for the prevention and treatment of a wide range of auto-inflammatory diseases that affect millions of children and adults, including asthma, atopic dermatitis, wheezing and other diseases of the respiratory and urinary systems.

The company will also begin development of new chemical entities aimed at improving the lives of patients with diabetic macular edema, pancreatitis, and both renal and pulmonary fibrosis. More than CHF 250 million has already been committed to these initiatives.

"We are building, together with our employees, a highly innovative biopharmaceutical company based on the unique bacterial lysate expertise developed over decades by OM Pharma, with the goal of improving patients' lives," says Mr Jornod.

Swiss Biotech Events of 2021

January 2021

- Addex completes USD 11.5 million capital increase to advance development of drug candidates based on allosteric modulation — FINANCING — Addex Therapeutics
- GenkyoTex announces positive Phase I results demonstrating a favorable safety and pharmacokinetic profile of high-dose setanaxib — PRODUCT DEVELOPMENT — GenkyoTex
- Relief Therapeutics announces new share subscription facility of CHF 50 millon with its main shareholder GEM — FINANCING — Relief Therapeutics
- Opterion Health secures EUR 8.4 million to progress its novel peritoneal dialysis (PD) solution into clinical trials — FINANCING — Opterion Health
- Novaremed secures USD 50 million capital commitment from GEM to progress development of non-opioid drug for diabetic peripheral neuropathy — FINANCING — Novaremed
- M&A — Arvelle Therapeutics — Arvelle Therapeutics anounces it has been acquired by Angelini Pharma, receiving USD 610 million following regulatory approval, and a further USD 350 million subject to lead candidate cenobamate reaching certain revenue targets
- COLLABORATION — Numab Therapeutics — Numab Therapeutics and Kaken Pharmaceutical form co-development alliance for a next-generation atopic dermatitis treatment option
- PRODUCT DEVELOPMENT — Swiss Pharmacan — Swiss Pharmacan reports successful Phase II clinical results for its anti-inflammatory ArtemiC COVID-19 treatment
- PRODUCT DEVELOPMENT — Addex Therapeutics — Addex Therapeutics receives IND approval to start a Phase IIa clinical study of ADX71149 in epilepsy
- M&A — Dinaqor — Dinaqor acquires EHT Technologies, a German-based engineered heart tissue (EHT) technology platform company

February 2021

- NLS Pharmaceutics lists on Nasdaq raising USD 20 million — FINANCING — NLS Pharmaceutics
- Basilea Pharmaceuticals receives USD 10 million milestone payment from Pfizer due to continued strong Cresemba® (isavuconazole) sales — COLLABORATION — Basilea Pharmaceutica
- AC Immune's Alzheimer's vaccine generates potent anti-pTau antibody response in Phase Ib/IIa study — PRODUCT DEVELOPMENT — AC Immune
- Basilea Phamaceutica successfully places 1 million new registered shares, raising gross proceeds of CHF 45.8 million — FINANCING — Basilea Pharmaceutica
- FINANCING — Cellvie — Swiss-US biotech Cellvie secures USD 5 million seed round to advance pipeline based on therapeutic mitochondria transfer
- FINANCING — Pharvaris — Pharvaris goes public on Nasdaq and raises USD 165 million
- PRODUCT DEVELOPMENT — Basilea Pharmaceutica — Basilea Pharmaceutica achieves preclinical milestone in oncology collaboration on potential first-in-class kinase inhibitor
- COLLABORATION — BioVersys — BioVersys, TASK and GSK receive EURO 2.7 million from the European and Developing Countries Clinical Trials Partnership (EDCTP) for Phase IIa clinical trial
- M&A — Roivant Sciences — Roivant Sciences grows computational drug discovery engine with acquisition of Silicon Therapeutics

March2021

- Idorsia Pharmaceuticals submits NDA for clazosentan to Japanese PMDA — PRODUCT DEVELOPMENT — Idorsia Pharmaceuticals
- Molecular Partners and Novartis report positive initial results from Phase I study of its COVID-19 antiviral therapy, ensovibep, in healthy volunteers — PRODUCT DEVELOPMENT — Molecular Partners
- Relief Therapeutics announces CHF 10 million private placement — FINANCING — Relief Therapeutics
- Molecular Partners and Novartis announce inclusion of COVID-19 antiviral candidate, ensovibep, in NIH-sponsored ACTIV-3 trial — PRODUCT DEVELOPMENT — Molecular Partners
- SpyBiotech licenses Selexis cell line development technologies to advance human cytomegalovirus VLP vaccine program — COLLABORATION — Selexis
- Gain Therapeutics raises USD 46 million through Nasdaq listing — FINANCING — Gain Therapeutics
- Genedata (Success Story Award Winner 2022) announces that Top-10 Japanese pharmaceutical company Mitsubishi Tanabe has selected Genedata Screener® to standardize assay analysis workflows — COLLABORATION — GeneData
- The European Medicines Agency's CHMP recommends marketing authorization for Idorsia Pharmaceutical's Ponvory® (ponesimod) to treat adults with relapsing forms of multiple sclerosis — PRODUCT DEVELOPMENT — Idorsia Pharmaceuticals
- PRODUCT DEVELOPMENT — Idorsia Pharmaceuticals — Idorsia Pharmaceuticals submits European marketing authorization application for daridorexant for the treatment of adult patients with insomnia
- PRODUCT DEVELOPMENT — Idorsia Pharmaceuticals — FDA accepts the new drug application for review of Idorsia Pharmaceutical's daridorexant for the treatment of adult patients with insomnia
- PRODUCT DEVELOPMENT — Asceneuron — Asceneuron awarded USD 2.2 million by the Alzheimer's Drug Discovery Foundation (ADDF) to advance into Phase I clinical trials
- PRODUCT DEVELOPMENT — Versantis — Versantis announces positive results from Phase Ib clinical trial of VS-01 in decompensated liver cirrhosis
- MARKET ACCESS — Idorsia Pharmaceuticals — Idorsia Pharmceuticals receives FDA approval for Ponvory® (ponesimod) to treat adults with relapsing forms of multiple sclerosis
- COLLABORATION — Relief Therapeutics — Relief Therapeutics and Acer Therapeutics sign collaboration and licensing agreement for the worldwide development and commercialization of ACER-001 for the treatment of urea cycle disorders (UCDs) and maple syrup urine disease (MSUD)
- PRODUCT DEVELOPMENT — Basilea Pharmaceutica — Basilea Phamaceutica reports positive interim results from Phase II study FIDES-01 for derazantinib in FGFR2 patients with bile duct cancer (iCCA)

April 2021

- ACM Biosciences closes first financing round to accelerate the development of its polymersome vaccine platform and a second-generation COVID-19 vaccine — FINANCING — ACM Biosciences
- Lonza and Junshi Biosciences announce collaboration to accelerate the development and manufacturing of biologics — COLLABORATION — Lonza
- BioVersys receives USD 20 million in EU financing to support development of new antibiotics — FINANCING — BioVersys
- PRODUCT DEVELOPMENT — Molecular Partners — Molecular Partners shares new Covid-related preclinical data from its AML-Focused CD3 T-cell engager program, CD40 product candidate MP0317, and other novel immuno-oncology approaches
- FINANCING — VectivBio — VectivBio announces closing of USD 146.6 million IPO on Nasdaq

April 2020

- Kinarus initiates European Phase II study of KIN001 for hospitalized patients infected with COVID-19 — PRODUCT DEVELOPMENT — Kinarus
- Lonza announces construction of a new small molecule manufacturing complex in Visp — PRODUCT DEVELOPMENT — Lonza
- Alithea Genomics wins CHF 150,000 from VentureKick to further develop its BRB-seq kit technology for RNA sequencing — AWARD — Alithea Genomics
- PolyPeptide Group announces successful IPO at SIX Swiss Exchange raising CHF 191 million — FINANCING — PolyPeptide
- M&A — Mestex — Mestex and its Phase III-ready treatment for osteoarthritis of the knee acquired by Grünenthal
- FINANCING — Pureos BioVentures — Pureos Bioventures expands fund size to USD 205 million focussing primarily on Switzerland and Europe
- MARKET ACCESS — ADC Therapeutics — ADC Therapeutics announces FDA approval of ZYNLONTA™ (loncastuximab tesirine-lpyl) in relapsed or refractory diffuse large B-cell lymphoma
- COLLABORATION — Lonza — Lonza and Moderna enter into new agreement to double drug substance production for COVID-19 vaccine in Visp
- PRODUCT DEVELOPMENT — Abionic — Multicenter clinical trial confirms ability of Abionic's PSP biomarker to detect sepsis earlier than current standard-of-care

May 2021

- Roivant Sciences strikes SPAC deal valuing the company at USD 7.3 billion — MARKET ACCESS — Roivant Sciences
- PolyPeptide Group announces the exercise of the full over-allotment option in connection with its IPO — FINANCING — PolyPeptide
- CRISPR Therapeutics and Nkarta announce global collaboration to develop gene-edited cell therapies for cancer — COLLABORATION — CRISPR Therapeutics
- Evolva secures CHF 20 million investment facility for future growth with Nice & Green — FINANCING — Evolva
- Memo Therapeutics announces its antibodies show efficacy against COVID-19 variants — PRODUCT DEVELOPMENT — Memo Therapeutics
- Basilea announces it had been awarded a CARB-X grant of up to USD 2.7 million to develop a novel-class of antibiotics — FINANCING — Basilea Pharmaceutica
- ObsEva announces postive final results from the Phase III PRIMROSE program of Yselty® (linzagolix) for the treatment of uterine fibroids — PRODUCT DEVELOPMENT — ObsEva
- HAYA Therapeutics raises CHF 18 million seed financing to advance anti-fibrotic therapies targeting long non-coding RNAs — FINANCING — HAYA Therapeutics
- Cutiss announces first large scale transplantation of denovoSkin has delivered proof of principle — PRODUCT DEVELOPMENT — Cutiss
- Vir Biotechnology and GSK announce sotrovimab has received Emergency Use Authorization from the FDA for treatment of mild-to-moderate COVID-19 in high-risk adults and pediatric patients — MARKET ACCESS — Humabs Biomed/Vir Biotechnology
- ACM Biosciences and Dr. Steve Pascolo, University Hospital Zurich, awarded Innosuisse grant to partner and develop a stable mRNA COVID-19 vaccine — FINANCING — ACM Biosciences
- PRODUCT DEVELOPMENT — ObsEva — ObsEva completes enrollment of Yselty® (linzagolix) Phase III EDELWEISS 3 trial for patients with moderate to severe endometriosis-associated pain
- FINANCING — Oculis — Oculis closes USD 57 million Series C financing to advance late stage ophthalmic portfolio
- PRODUCT DEVELOPMENT — Auris Medical — Auris Medical reaches midpoint for enrollment in Part B of AM-125 Phase II TRAVERS trial in acute peripheral vertigo
- FINANCING — ADC Therapeutics — ADC Therapeutics announces receipt of USD 50 million second tranche of convertible credit facility with Deerfield
- PRODUCT DEVELOPMENT — Novimmune — Novimmune reaches a predefined clinical milestone in TG Therapeutics collaboration for its TG-1801 bispecific antibody targeting CD19 and CD47
- COLLABORATION — InSphero — InSphero and Hamilton unveil collaboration on 3D microtissues
- FINANCING — Numab Therapeutics — Numab completes oversubscribed CHF 100 million series C financing
- MARKET ACCESS — Idorsia Pharmaceuticals — European Commission approves Ponvory® (ponesimod) for the treatment of adults with relapsing forms of multiple sclerosis
- PRODUCT DEVELOPMENT — ADC Therapeutics — ADC Therapeutics Phase I study demonstrates encouraging potential of camidanlumab tesirine (Cami) to provide a new treatment option for relapsed or refractory Hodgkin lymphoma
- PRODUCT DEVELOPMENT — Molecular Partners — Novartis and Molecular Partners announce start of EMPATHY clinical trial for ensovibep for the treatment of COVID-19

June 2021

- Polyphor's balixafortide demonstrates consistent dual action anti-viral and anti-inflammatory activity in COVID-19 preclinical trials — PRODUCT DEVELOPMENT — Polyphor
- Auris Medical acquires US RNA therapeutics company Trasir Therapeutics Inc — M&A — Auris Medical
- FDA approves Biogen's aducanumab licensed from Neurimmune for Alzheimer's disease — MARKET ACCESS — Neurimmune
- Molecular Partners announces launch of American Depositary Shares (ADS) offering in the US — FINANCING — Molecular Partners
- Molecular Partners announces first patient dosed in COVID-19 NIH-sponsored ACTIV-3 trial evaluating antiviral candidate Ensovibep — PRODUCT DEVELOPMENT — Molecular Partners
- PRODUCT DEVELOPMENT — Santhera — Santhera and ReveraGen announce positive and statistically highly significant topline results with vamorolone in pivotal VISION-DMD study
- FINANCING — BioVersys — CARB-X funds BioVersys up to USD 15.34 million to further develop pyrrolocytosines, a novel class of broad-spectrum antibiotics
- PRODUCT DEVELOPMENT — Pharvaris — Pharvaris presents pharmokinetic and pharmacodynamic data for oral PHA121 for treatment of hereditary angioema
- PRODUCT DEVELOPMENT — Idorsia Pharmaceuticals — Idorsia presents new Phase III data on daridorexant in insomnia at SLEEP 2021
- PRODUCT DEVELOPMENT — ObsEva — ObsEva presents PROLONG Phase IIa proof-of-concept data on ebopiprant (OBE022) for the treatment of spontaneous preterm labor

Swiss Biotech Events of 2021

June 2021

- Deep Breath Intelligence accounces collaboration with Bayer on obstructive sleep apnoea — COLLABORATION: Deep Breath Intelligence
- ADC Therapeutics announces encouraging interim results from pivotal Phase II clinical trial of Cami (camidanlumab tesirine) — PRODUCT DEVELOPMENT: ADC Therapeutics
- VectivBio receives FDA orphan drug designation for apraglutide in acute graft-versus-host disease (aGVHD) — PRODUCT DEVELOPMENT: VectivBio
- FINANCING: Alentis Therapeutics — Alentis Therapeutics raises USD 67 million in series B financing to advance anti-fibrotic drug candidates into the clinic
- PRODUCT DEVELOPMENT: Santhera — Santhera announces Phase IV LEROS Trial with Raxone® met primary endpoint in patients with Leber's hereditary optic neuropathy
- M&A: Relief Therapeutics — Relief Therapeutics and Applied Pharma Research sign agreement for Relief to acquire all outstanding shares of Applied Pharma Research

July 2021

- Lonza completes divestment of speciality ingredients business — DIVESTMENT: Lonza
- Topadur Pharma announces completion of TOP-N53 Phase I diabetic wound healing study — PRODUCT DEVELOPMENT: Topadur
- GeNeuro closes successful EURO 6.0 million private placement to facilitate Phase III planning and partnering discussions for temelimab treatment in multiple sclerosis patients with disability progression without relapses — FINANCING: GeNeuro
- Sanofi extends collaboration with Genedata for pharmaceutical development and manufacturing science — COLLABORATION: Genedata
- Targimmune Therapeutics raises CHD 17.7 million to develop novel targeted RNA immunotherapies — FINANCING: TargImmune Therapeutics
- Organon and ObsEva enter global license agreement to develop and commercialize Ebopiprant as a first-in-class treatment for preterm labor — COLLABORATION: ObsEva
- AC Immune announces strategic acquisition of Parkinson's disease vaccine candidate and equity investment led by Athos Service — M&A / FINANCING: AC Immune
- Relief Therapeutics and AdVita finalize agreement for Relief to acquire all outstanding shares of AdVita — M&A: Relief Therapeutics
- AC Immune presents promising full Phase Ib results on anti-abeta vaccine and profiles its first-in-class diagnostic for Parkinson's disease — PRODUCT DEVELOPMENT: AC Immune
- FINANCING: Acthera Therapeutics — Acthera Therapeutics closes CHF 5.4 million seed A financing round augmented by significant non-dilutive funding through collaborations with academic and non-academic partners
- PRODUCT DEVELOPMENT: LimmaTech Biologics — LimmaTech Biologics announces the start of a Phase I/II trial of a novel Klebsiella vaccine candidate
- PRODUCT DEVELOPMENT: Relief Therapeutics — Relief Therapeutics reports that collaboration partners NRx Pharmaceuticals and Quantum Leap have announced treatment of severely ill COVID-19 patients with aviptadil in the I-SPY COVID trial
- COLLABORATION: Lonza — Lonza extends collaboration with major biopharmaceutical partner for large-scale commercial supply of monoclonal antibodies
- FINANCING: Relief Therapeutics — Relief Therapeutics announces CHF 15 million private placement to accelerate development of lead candidate, RLF-100 and acquire additional assets
- FINANCING: Sophia Genetics — Sophia Genetics closes USD 234 million Nasdaq IPO and USD 20 million private placement
- FINANCING: Idorsia Pharmaceuticals — Idorsia Pharmaceuticals completes CHF 600 million convertible bonds offering to support commercial product launches in several key markets in 2022
- PRODUCT DEVELOPMENT: Basilea Pharmaceutica — Basilea Pharmaceutica receives FDA orphan drug designation for treatment of malignant glioma with isavanbulin

August 2021

- Atlas Antibodies acquires biotech service provider evitria — M&A: evitria
- RocketVax raises CHF 7.2 million to advance clinical studies for its COVID-19 vaccine — FINANCING: RocketVax
- Cellestia Biotech receives investment to advance first-in-class therapies to control and modulate pathogenic gene expression — FINANCING: Cellestia
- Sophia Genetics announces exercise of IPO-related Green shoe over-allotment option totalling USD 9.35 million — FINANCING: Sophia Genetics
- AC Immune announces first positive cognitive results for a tau-targeting monoclonal antibody in Alzheimer's disease in Phase II trial of semorinemab — PRODUCT DEVELOPMENT: AC Immune
- PRODUCT DEVELOPMENT: Relief Therapeutics — Relief Therapeutics announces FDA orphan drug designation for the use of RLF-100 in the treatment of sarcoidosis
- M&A: ObsEva — ObsEva receives USD 500 million in upfront and milestone payments from Organon for the global development, manufacturing and commercial rights to ebopiprant
- FINANCING: Basilea Pharmaceutica — Basilea Pharmaceutica is awarded an additional USD 4.3 million by BARDA to support Phase III development of its novel antibiotic ceftobipole
- COLLABORATION: Sophia Genetics — Dasa expands partnership with Sophia Genetics for the first decentralized cancer biomarker detection solution in Latin America
- FINANCING: ADC Therapeutics — ADC Therapeutics sells capped royalty interest on ZYNLONTA® and Cami for USD 225 million upon closing with an additional USD 100 million in potential near-term milestone payments

September 2021

- Versantis announces FDA orphan drug designation for its lead candidate VS-01 for the treatment of hyperammonemia (HA) in inborn errors of metabolism (IEM) — PRODUCT DEVELOPMENT: Versantis
- ADC Therapeutics receives orphan drug designation in Europe for ZYNLONTA, a CD19-targeted ADC, for the treatment of diffuse large B-cell lymphoma (DLBCL) — PRODUCT DEVELOPMENT: ADC Therapeutics
- AWARD: T3 Pharmaceuticals — T3 Pharma wins the Swiss Economic Forum Award 2021 in the High-tech/Biotech category
- M7A: Polyphor — Polyphor and EnBiotix announce closing of purchase agreement of inhaled murepavadin by EnBiotix

September 2021

- Kinarus secures CHF 57 million commitment from GEM to broaden the clinical Phase II portfolio of lead candidate KIN001 — FINANCING: Kinarus
- Anjarium Biosciences raises CHF 55.5 million series A financing to develop next-generation non-viral gene therapies — FINANCING: Anjarium Biosciences
- Arctos Medical, a Swiss startup developing optogenetic therapies for treating blindness, acquired by Novartis — M&A: Arctos Medical
- Basilea's partner Asahi Kasei Pharma files new drug application for the marketing authorization of isavuconazole in Japan — MARKET ACCESS: Basilea Pharmaceutica
- M&A: Novaremed — Novaremed acquires Metys Pharmaceuticals
- PRODUCT DEVELOPMENT: Nouscom — Nouscom announces intial Phase I results for NOUS-209 "off-the-shelf" neoantigen cancer vaccine in MSI-H solid tumors
- FINANCING: Santhera — Santhera secures CHF 45 million for FDA new drug application for vamorolone in DMD following successful results from the pivotal VISION-DMD study
- ACQUISITION: VectivBio — VectivBio announces closing of Comet Therapeutics acquisition

October 2021

- Roivant Sciences closes business combination with Montes Archimedes Acquisition Corp. and concurrent PIPE financing — ACQUISITION: Roivant Sciences
- MetrioPharm strengthens equity by CHF 27.5 million to support ongoing Phase II trial in COVID-19 as well as preclinical studies in other indications — FINANCING: MetrioPharm
- Bachem raises CHF 583.5 million through capital increase to accelerate ongoing capacity expansion — FINANCING: Bachem
- ADC Therapeutics announces validation of its marketing authorization application by the European Medicines Agency for ZYNLONTA® — MARKET ACCESS: ADC Therapeutics
- COLLABORATION: Genedata — Genedata announces successful development of precision medicine tool for rheumatoid arthritis with Egis Pharmaceuticals
- M&A / FINANCING: MoonLake Immunotherapeutics — MoonLake Immunotherapeutics announces planned IPO via SPAC with Helix Acquisition Corp to advance tri-specific Nanobody® Sonelokimab
- FINANCING: Idorsia Pharmaceuticals — Idorsia Pharmaceuticals announces that Johnson & Johnson has partially converted its convertible loan

November 2021

- GlycoEra raises CHF 45 million in series A financing to develop novel biologics based on proprietary glycoengineering platform — FINANCING: GlycoEra
- AC Immune announces interim Phase Ib/II data showing that its ACI-35.030 anti-pTau Alzheimer's vaccine generates a potent immune response — PRODUCT DEVELOPMENT: AC Immune
- Biocartis reports new study that demonstrates Idylla™ EGFR Mutation Test shortens patient management decision times for non-small cell lung cancer cases — PRODUCT DEVELOPMENT: Biocartis
- Procavea Biotech is announced as winner of 2021 Swiss Technology Award — AWARD: Procavea Biotech
- Biocartis' SeptiCyte® RAPID receives FDA 510(k) clearance for differentiating sepsis from infection-negative systemic inflammation in hospitalized patients suspected of sepsis — MARKET ACCESS: Biocartis
- ACQUISITION: Covis — Covis strengthens global respiratory portfolio through acquisition of two medicines from AstraZeneca
- FINANCING: Debiopharma — Debiopharma invests USD 4 million in cell & gene therapy start-up Mekonos Inc.
- PRODUCT DEVELOPMENT: Addex Therapeutics — Addex Therapeutics' strategic partner in Japan, Janssen Pharmaceuticals (JnJ), completes Phase I trial with ADX71149 in epilepsy
- PRODUCT DEVELOPMENT: CRISPR Therapeutics — CRISPR Therapeutics and ViaCyte, Inc. to start clinical trial of the first gene-edited cell replacement therapy for treatment of type 1 diabetes
- M&A: Inositec — Vifor Pharma acquires Sanifit Therapeutics and Inositec to spearhead development in vascular calcification field
- FINANCING: Evolva — Evolva announces that private placement of 68.3 million shares to Veraison has raised gross proceeds of CHF 7.5 million

December 2021

- Sophia Genetics announces launch of DEEP-Lung-IV muiltmodal clincial study to validate predictive signatures associated with response to immunotherapy and prognosis of patients with stage IV non-small cell lung cancer — PRODUCT DEVELOPMENT: Sophia Genetics
- Biocartis reports Idylla™ SARS-CoV-2 testing successfully detects Omicron variant — PRODUCT DEVELOPMENT: Biocartis
- Molecular Partners confirms ensovibep retains neutralization of the Omicron variant in preclinical studies — PRODUCT DEVELOPMENT: Molecular Partners
- GeNeuro receives CHF 6.7 million in funding from the Swiss government for the development of temelimab against long-COVID — FINANCING: GeNeuro
- Memo Therapeutics receives CHF 10.5 million from Swiss Federal Funding Program to clinically develop SARS-CoV-2 antibody against COVID-19 — FINANCING: Memo Therapeutics
- FINANCING: Basilea Pharmaceutica — Basilea Pharmaceutica receives USD 10 million milestone payment from Pfizer triggered by continuing strong sales of Cresemba® (isavuconazole)
- M&A: deepCDR Biologics — deepCDR Biologics is acquired by Alloy Therapeutics
- FINANCING: Rejuveron — Rejuveron increases to near-majority stake in Endogena by providing funding of USD 20 million to progress treatments for degenerative diseases of the eye
- FINANCING: Kinarus — Kinarus receives CHF 7 million grant from the Swiss Federal Funding Program for COVID-19 medicines

Swiss Biotech Events of 2021

CONTINUED

December 2021

- Molecular Partners announces collaboration with Novartis to develop DARPin-conjugated radioligand therapeutic candidates for oncology — COLLABORATION — Molecular Partners
- Polyphor and EnBiotix announce dosing of first patient in Phase I trial of inhaled murepavadin — PRODUCT DEVELOPMENT — Polyphor
- Relief Therapeutics files registration statement on form 20-F with the U.S. Securities and Exchange Commission — FINANCING — Relief Therapeutics
- Addex raises USD 10 million in equity financing to advance its clinical and preclinical pipelines — FINANCING — Addex Therapeutics
- Merck acquires Chord Therapeutics to expand neuroinflammatory pipeline — M&A — Chord Therapeutics
- Polyphor and EnBiotix Inc. announce EnBiotix has completed a convertible debenture raise of USD 11 million to finance its future operations — FINANCING — Polyphor
- ACQUISITION — Vifor Pharma — Vifor Pharma receives acquisition offer from CSL Limited
- COLLABORATION — Numab Therapeutics — Numab and 35Bio's Sunshine Guojian expand partnership to develop novel T cell engager NM28
- FINANCING — Anaveon — Anaveon raises CHF 110 million in oversubscribed series B financing to pursue multiple parallel Phase II progams for its lead candidate, ANV419, a powerful and selective interleukin-2 (IL-2) agonist in patients with solid tumors
- PRODUCT DEVELOPMENT — ObsEva — ObsEva announces positive CHMP opinion for Linzagolix, an oral GnRH antagonist for the treatment of uterine fibroids
- PRODUCT DEVELOPMENT — Basilea Pharmaceutica — Basilea announces FDA approval of IND application for novel mitotic checkpoint inhibitor candidate BAL0891
- FINANCING — Basilea Pharmaceutica — Basilea receives USD 10 million milestone payment related to approval of antifungal Cresemba® (isavuconazole) in China
- M&A — Polyphor — Polyphor closes merger with EnBiotix and is renamed Spexis

Disclaimer:

This information was selected and compiled on the basis of publicly available information only. We therefore cannot guarantee that all events are included in the above summary for 2021.

Swiss Biotech Report: Contributors' Profiles

Swiss Biotech Association
The Swiss Biotech Association has represented the interests of the Swiss biotech industry since 1998. To support its members in a competitive market, the Swiss Biotech Association works to secure favorable framework conditions and facilitate access to talents, novel technologies and financial resources. To strengthen and promote the Swiss biotech industry, the Swiss Biotech Association also collaborates with numerous partners and life science clusters globally under the brand Swiss Biotech™.
www.swissbiotech.org

EY
EY is a global leader in assurance, tax, transaction and advisory services. The insights and quality services we deliver help build trust and confidence in the capital markets and in economies the world over. Our Global Life Sciences Sector brings together a worldwide network of 23,000 sector-focused professionals to anticipate trends, identify their implications and help our clients create competitive advantage. We can help you navigate your way forward and achieve sustainable success in the new health-outcomes-driven ecosystem.
www.ey.com/lifesciences

scienceindustries
scienceindustries is the Swiss business association of chemistry, pharma and life sciences. It supports some 250 member companies: fostering an innovation-friendly environment in Switzerland, creating a competitive production and business framework, enabling attractive market conditions, and facilitating worldwide market access.
www.scienceindustries.ch

Swiss National Science Foundation
The Swiss National Science Foundation (SNSF) is Switzerland's foremost research funding agency. In accordance with its government mandate, the SNSF supports scientific research in all disciplines, from physics to medicine to sociology. Each year the best projects are awarded around CHF 900 million in total based on rigorous evaluation processes. The SNSF supports 5700 projects involving 20,000 researchers at year-end 2021.
www.snsf.ch

Swiss Federal Institute of Intellectual Property
The Swiss Federal Institute of Intellectual Property is the official government body for intellectual property rights in Switzerland and is responsible for examining, granting and administering these rights. The institute's services also include training courses on various aspects of intellectual property and tailor-made searches for trademarks and patent information, including strategic patent analyses involving patent quality parameters.
www.ige.ch

biotechnet
biotechnet Switzerland is the hub encompassing the preferred Swiss partners from academia, university hospitals and research organizations to promote translational research and advance biotechnology in Switzerland.
www.biotechnet.ch

Swiss Academy of Engineering Sciences SATW
SATW is a network of engineering experts contributing to the progress and competitiveness of the Swiss economy. Positioning Switzerland in a leading role is one of the key goals of the academy, and we work to identify promising technologies and assemble the best experts to foster innovation. SATW is also the leading organization for encouraging young women to pursue a career in a technical field.
www.satw.ch

SIX
SIX Swiss Exchange is the leading European exchange for companies from the life sciences sector. The exchange is the fourth largest overall in Europe in terms of both free float market capitalization and trading volume. It hosts 3 of the 5 highest capitalized companies in Europe and with Sparks - the new equity segment for small and medium-sized companies – SIX Swiss Exchange is also the ideal place to list when i t comes to growing your SME.
www.six-swiss-exchange.com

Switzerland Global Enterprise
Switzerland Global Enterprise (S-GE) is mandated by the Swiss government for export and investment promotion. In its role as a center of excellence for internationalization, its mission is to help Swiss SMEs develop new potential for their international business and to strengthen Switzerland as an economic hub. S-GE assists foreign companies in evaluating Switzerland as a business and technology location, and together with its cantonal partners helps companies during the entire site selection and incorporation process.
www.s-ge.com/invest-biotech

The contributors have been listed in order of appearance in this report

"The products of a real innovation should have a significant value for society. Many innovations occur on the boundaries of different fields, which shows the importance interdisciplinary collaboration."

Ernst C. Wit
Università della Svizzera italiana

"In the area of biotech patents, Switzerland has the highest market coverage and an exceptionally high technology relevance. "World biotech" rates significantly better than patented technology in general. "Swiss biotech" is even more highly rated - up to 3.4 times world biotech in recent years."

David Rees
Swiss Federal Institute of Intellectual Property

"Switzerland is one of the leading global locations for blockchain and distributed ledger technology and also provides the accompanying legal framework to enable innovation in this field. Blockchain has the potential to become a true game changer in the industrial biotech sector."

Hans-Peter Meyer
SATW

"One lesson learned from the pandemic is that we are stronger together and that distances matter. The proximity, complementary knowledge, experience, and focus of Swiss research organizations and industry promote collaborations that propel innovation."

Laura Suter-Dick
Biotechnet

SWISS BIOTECH™

Impressum

Steering Committee
Michael Altorfer, Swiss Biotech Association
Florian Fisch, Swiss National Science Foundation
Fabian Gerber, SIX Swiss Exchange
Jan Lucht, scienceindustries
Hans-Peter Meyer, SATW
David Rees & Ingrid N. Müller, Swiss Federal Institute of Intellectual Property
Laura Suter-Dick, biotechnet Switzerland
Sirpa Tsimal, Switzerland Global Enterprise
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Ed Gover | Conscience Creative Partnership
Printer
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