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Biotech News Bulletin

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Swiss Confederation
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One Nation, One Biotech Cluster

No 9, April 2015

Editorial

Prof. Dr. Daniel Gygax

Applied Projects between Industry and Academia bear successful results. Working with innovative companies, the academic research wins experience and develops a sense of customer needs. Some examples of combined successes are presented in this bulletin. Also noting needs the success of a Biotech company on foreign soil that led to a nomination by S-GE, Switzerland Global Enterprise.

Domenico Alexakis

COMPANY IN FOCUS EXPORT

InSphero

Toxic substances in medicines or cosmetics are often barely detectable, but even the smallest of quantities can have the greatest of impacts. If by some unfortunate event a 'toxic' product does indeed appear on the market, it is not only the health of consumers that is at stake – the financial damage for manufacturers can reach the millions or even billions.

Here, InSphero AG can provide a remedy. The biotechnology company based in Schlieren, Switzerland, and founded in 2009 has developed a novel method that utilises organotypic 3D tissues to simplify the testing of substances. Whilst practically ruling out the risk of misanalysis, the technique can also be used for the more efficient and effective development of new substances. InSphero has successfully exported the technology to 31 countries, including in the EU and US, and has developed an intelligent method of packaging for direct delivery to customers from Switzerland via standard parcel post. Such deliveries pose significant challenges, as these packages contain living microtissues that require temperature- as well as time-sensitive freight.

"Between 2012 and 2014, we were able to reduce the requirement for manual intervention in overseas shipments from 25 to 10 percent, despite a tripling of delivery quantities over the same period," says Björn Niggemann, Head of Operations and Export at InSphero. In the meantime, the 15 largest pharmaceutical companies as well as the No. 1 in cosmetics and three of the top ten chemical firms in the world work with the Zurich-based SME.

Today, InSphero's export share is 90 percent. For 2015, the SME is aiming for revenues of 4.5 million Swiss francs and is pursuing ambitious growth plans. "We expect that in the years to come, the global market volume in which we are interested will grow to 600 million francs," says Jan Lichtenberg, CEO of InSphero. In the medium term, a market share of around 20 to 30 percent is wholly realistic for InSphero. Lichtenberg considers his optimistic outlook to be well founded: "With our product, we can replace technologies that are already 30 years old." In the course of this year, the company will open its own production site in the US, and plans for the early commissioning of an Asia hub in Singapore or Hong Kong are already underway.

TECHNOLOGY RESEARCH

Agroscope and CSEM working together to develop new agricultural technologies

Bern, 27.01.2015 - Agroscope and the private research and technology company CSEM plan to intensify their collaboration. The two research organisations want to tap into the potential synergies that micro- and nanotechnologies, microelectronics, photovoltaics and communications technologies can offer for industry, agriculture, and the environment. The plan is to work together to create instruments and processes that will improve agricultural productivity while conserving natural resources.

"Innovative technologies can help to make agriculture and the food industry more sustainable," explained Bernard Lehmann, Director of the Swiss Federal Office for Agriculture (FOAG).

Joint research projects Agroscope and CSEM want to tap into the possibilities that innovative technologies can offer within the agricultural sector. CSEM has extensive experience working with sensors, microelectronics, analysis, and data processing. The combination of CSEM's specialist knowledge and Agroscope's agronomic expertise should exploit new opportunities for the sector. The aim is to improve the quality of agricultural products and make processes more environmentally friendly, efficient, and accurate. To this end, experts from both institutes will work together to develop new ideas and to plan and implement research projects.

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Published 3 times a year (print or pdf.)

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Enzymatic GHB test as a potential screening tool for a rare disease

Succinic semialdehyde dehydrogenase deficiency (SSADH) describes a paediatric metabolic disease which results in a dysfunction of the enzyme succinic semialdehyde dehydrogenase. 450 cases are known worldwide. Patients suffering from this disease accumulate γ-hydroxy-butyric-acid (GHB) and γ-amino-butyric acid (GABA), which leads to delayed acquisition of motor and language development, as well as epilepsy, mental retardation, sleep disorder, ataxia, muscle hypotonia and behavioural disturbance.

GHB is also known to as a "club drug" or "date rape" drug and can be quantitatively determined using an enzymatic assay. The commercially available test-kit was developed by a consortium of Bühlmann Laboratories AG, the University Hospital Basel and the School of Life Sciences FHNW in Muttenz. Besides the genetic analysis to confirm the mutation of the Aldh5a1-gene the idea came up to apply the enzymatic, automated GHB-test from Bühlmann Laboratories AG as screening tool for identifying disorders in the metabolic pathway of GABA.

In a pilot study in cooperation with the US-American based SSADH Association, the Kantonsspital Baselland Bruderholz and the Buhlmann Laboratories the School of Life Sciences FHNW is planning to measure GHB in urine samples of SSADH-deficient children. With this test a fast and easy screening method would be available to detect a possible SSADH deficiency in patients.

RESEARCH PROJECT 1

Assessment of a drug candidate for the treatment of two rare orphan diseases: Morquio type B disease and GM1 gangliosidosis

Morquio type B disease and GM1 gangliosidosis are two rare orphan genetic disorders caused by mutated forms of the enzyme beta-galactosidase. A selective beta-galactosidase inhibitor was identified as a potential rescuer of the mutated enzyme, as it helps the folding of the enzyme in cells of Morquio type B disease and GM1 gangliosidosis patients. In an interdisciplinary project, the synthesis of an iminosugar derivative was assessed, alternative routes evaluated and the synthetic route improved for scale-up. Further, its efficacy was determined and measured on patient cells and its in vivo bioavailability was evaluated. DORPHAN S.A. (Project Management and Bioassays): Stéphane Demotz, Julie Charollais-Thoenig

HES-SO;- HEIA-FR (Synthesis): Roger Marti, Jean-Pascal Bourgeois - HEVS (Bioanalytics): Marc Mathieu - USZ Universitätsspital Zürich (Biosassays): Patricie Burda

RESEARCH PROJECT 2

Preventing Antibiotic Resistance by Switching off its Activity

When infection becomes resistant to traditional medication, there seems to be an urgent need for more expensive therapies. One Single Platform – Various Applications Based on the lessons learned from the TB experience, the BioVersys founders wanted to attack nosocomial, i.e. hospitalacquired infections. As the US Centers for Disease Control and Prevention have confirmed for 2013, every twentieth person is the victim of this type of infection, which can prove fatal and which costs the US healthcare system up to 10 billion dollars a year. With the support of the Commission of Technology and Innovation CTI, a National Research Consortium was launched with aim of developing a medicine for successfully holding antibiotic resistance in check. Part of the project involves the Life Sciences group headed by Prof. Daniel Gygax, FHNW Muttenz, and specialized in bioanalysis. The researchers want to determine the in vitro binding of the molecules – synthesized by their colleagues in Wädenswil – to the target protein with a biosensor system, labelfree and in real-time. "This will enable us to quantify the binding performance of potentially new active substances and facilitate a rational selection of chemical compounds", comments Daniel Gygax. "We also want to generate a high-resolution 3D structure

Academic Project Team consisted of: Rainer Riedl ZHAW, Nina Khanna, University of Basel, Vincent Perreten, University of Bern, Jacques Schrenzel, Universityof Geneva, Daniel Gygax FHNW

Business Project Team BioVersys; Michel Pieren, Marc Gitzinger, Marcel Tiggers

RESEARCH PROJECT 3

Novel Approach to Shear-sensitive Fluids. When Research and Industry Get Creative Together

In the modern biopharmaceutical industry, liquids inupstream and downstream process steps are usually conveyed bydiaphragm or peristaltic pumps. The issue was discussed with engineers from Levitronix GmbH in Zurich at the 2010 Single-Use Conference held at ZHAW Wädenswil and organized by Regine and Dieter Eibl,both professors. Levitronix specializes in ultraclean handlingsystems for fluids in microelectronic, life science and industrial applications.

Combining Expertise

The engineers at Levitronix worked with Dieter Eibl, an expertin the application of single-use technology in biopharmaceutical production at ZHAW Wädenswil, to develop a centrifugal pump system with magnetic bearings. The system is dedicated to the use with SU technology and ensures a pulsation-free transfer of fluids. Unlike conventional centrifugal pumps, the geometry of the pump head has been modified for use with SU systems – in asimilar way to established multi-use pumps – to keep shear stressand the resulting shearing forces low. The pump head is madeof plastic and can be replaced and disposed of after every use.

This avoids the typical disadvantages of conventional pumps,such as leakage, and expands the operating range of SU pumpsto perform at higher flow rates."In order to evaluate the mechanical stress generated bypumps, we performed shear-stress tests with shear-sensitivefluids such as cell suspensions and enzyme solutions," explains Dr. Pascal Bösch, Manager Product Development. "We werealso able to analyze mechanical stress under reproducible, costloweringand time-saving conditions by using non-biologicalmodel evaluation systems." The Levitronix team investigatedthe feasibility of the pumps in tests with protein solutions. It isimportant forpurification processes to evaluate the mechanicalstress that proteins are exposed to.

WHAT IS AHEAD?

Spark Award by ETHZ

The 2015 Spark Award goes to a group of researchers led by ETH Professor Manfred Kopf, which has developed a method by which specific characteristics of immune cells can be identified. The technology could prove to be an important tool in personalised medicine.

More information at www.ethz.ch/en/news-and-events/eth-news/news/2015/04/brilliant-spark-for-personalised-therapies.html