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Biotech Meets Chemistry: Roche Invests in Customized Training

Elsbeth Heinzlmann, science + technology journalist

Abstract: In response to current needs, Roche is offering its employees an intensive course in biotechnology under the auspices of biotechnet Switzerland. Lecturers from ZHAW Wädenswil [university of applied science] give participants the benefit of their expertise in theory and laboratory practice. One valuable spin-off from this is that this extra-mural course will allow participants to create a permanent network.

Keywords: biotechnet Switzerland · Customized training

How can we give employees the technical knowledge they need for their work? This is a question that many companies may be asking themselves in the light of rapidly changing technology. It was also a problem for Roche when the company became aware in 2005 that it would have to start production of Avastin, a humanized monoclonal antibody used to treat advanced tumours, in 2007. There were only 25 people with biotech experience at Basel/Kaiseraugst after production of Roferon-A had been transferred to the Penzberg production site. This was nowhere near enough to launch Avastin production.

Industry and Research Standing Shoulder to Shoulder

Dr. **Daniel Gygax**, Professor for Life Sciences at FHNW Muttenz [University of Applied Sciences and Arts Northwestern Switzerland FHNW], approached Roche in his capacity as President of biotechnet Switzerland, offering the help of experts working at the Institute of Chemistry and Biological Chemistry (ICBC), the Institute for Biotechnology at ZHAW Wädenswil and the Institute for Life Technologies at HES-SO [University of

Applied Sciences Western Switzerland]. This matched Roche's desire to combine theory and practice in an experiment-focused environment. Discussions with the lecturers at the institutes led to the creation of an intensive course comprising the teaching of basic knowledge at Roche followed by three weeks working on mammalian cell culture with upstream processing and two weeks on downstream processing of recombinant proteins. In addition to this theory section, the main aim was to have participants put into practice their new knowledge of starting off cells in a bioreactor, product formation and product purification. "As there is no 'artisanal' vocational training for biotech production along the lines of what is available for chemistry and pharmaceutical technologies, that is to say something aimed at people who control large-scale processes in plants, Roche wants to teach technology and work steps in this pilot course. The aim is for the participants to speak the same language, regardless of whether they work in fermentation, protein purification or media production", explains **Daniel Stauffer**, a member of Roche's adult education team. "It was a daring mix, because the participants included people who had just completed their apprenticeship, chemists, pharmaceutical technologists, engineers and scientists."

The experiment turned out to be a complete success. The participants absorbed the knowledge they needed very quickly, learned to identify specific terms and to understand the overall context. But the time spent in Wädenswil, away from the routine of work, family and friends, had a very particular benefit: "As the participants were not all at the same level to begin with, it was quite natural that in lab sessions those who were more knowledgeable helped those who were less experienced", explained **Marco Bembo**, Acting Head of Learning and Development at Roche. "This led to the development of a network that remained intact long after the course. A strong team spirit grew, because the people from Roche also ate together in the hotel in the evening, were able to talk shop and chat about issues not related to work."

Knowledge in a Nutshell

The 'Roche course' has since celebrated its 10th anniversary. There is no need to 'promote' it: the participants' enthusiasm ensures that word gets about. "People who are interested are usually proactive and ask whether they can go on the course", says Marco Bembo. "Of course, we then need to check through everything else and see whether ZHAW has enough capacity for a course in Wädenswil." Participants face a challenging programme and have to take an examination at the end about what they have learned.

The first part of the course, given by the team led by Prof. **Regine Eibl**, lecturer in cell culture technology and head of the cell culture technology specialist group, focuses on upstream processing and troubleshooting. Participants learn the theory and perform practical exercises on scaling up mammalian cells, the path from cryovial to lab bioreactor, bioreactors for mammalian cells growing in suspension, and automation of cell culture bioreactors. As an example process, the research team demonstrates the cultivation of Chinese hamster ovary (CHO) suspension cells in chemically defined minimal medium. They explain how CHO cell-based antibody production takes place, and where



Theory and practice at the ZHAW in Wädenswil, customized to meet Roche's needs, give participants a common language irrespective of whether they work in fermentation or protein purification. Photo: Patrizia Sebregondi, ZHAW.



Participants learn about mammalian cell culture techniques for the production of recombinant proteins starting from cryovial to bioreactor. Photo: Patrizia Sebregondi, ZHAW.

one-way systems for biopharmaceutical production are useful. As a practical exercise in the cultivation of CHO cells, the ZHAW team compares shaking flasks and spinner flasks, or CeLLinie and TubeSpin, and weighs up the use of the stirred tank reactor against the rocking bag bioreactor or the standard/disposable reactor. “We want to teach participants the theoretical and practical principles of cultivating mammalian cells in common cultivation systems and bioreactors using modern automated analytical devices for in-process control”, explains Regine Eibl, who has specialized in the development of processes used in the production of active substances for the pharmaceutical and cosmetics industries. “The participants are asked to assess the results of cultivation, learn to spot problems that can arise in cell cultivation, and know what can be done to resolve them.”



In the hands-on course participants are introduced to the purification of recombinant proteins such as monoclonal antibodies and their analysis during the process and in the final product. Photo: Patrizia Sebregondi, ZHAW.

The second part of the course is taught by the team led by Prof. **Christiane Zaborosch**, who heads the biochemistry unit at ZHAW Wädenswil. Her laboratories are responsible for the purification and characterization of proteins used as active substances in medication. The participants operate computer-controlled chromatography systems, and perform affinity and ion exchange chromatography of the type used in the Avastin process in Basel. In-process controls are carried out to balance the yield in the downstream process and to check purity. Participants also learn how to apply the latest bioanalytical methods to characterize the target protein. “After this hands-on training course, participants

understand the principles of downstream processing in the production of recombinant proteins and are able to plan this kind of process”, explains Christiane Zaborosch, whose main R&D interest lies in recombinant protein technology, downstream processing and protein analysis. “They are able to set up a computer-controlled chromatography system and use it to purify proteins. They understand the theoretical principles of purifying recombinant proteins such as monoclonal antibodies and analyzing them during the process and in the finished product.” She considers it important for the participants to master the critical steps in the downstream process, and to recognize and where possible avoid errors.

An Ideal Approach Thanks to its Flexibility

To date, over 200 Roche employees have learned about biotech at the ZHAW Wädenswil course. “Of course, the situation has changed since the pilot course in 2005, as the Roche biotech department now has experienced employees”, explains Daniel Stauffer. “Internal know-how has grown, and basic knowledge about routine work can be given on the job. But the two lecturers in Wädenswil continue to work so flexibly that the course can be quickly adapted to new needs.” As there is now enough in-house experience, it has been possible to shorten the upstream processing and downstream processing courses to a week each.

Production manager **Marco Sonderegger** regularly monitors the requirement profile with **Matthias Kaiser**, Roche’s Head of Training/GMP Support, and adapts the course content to the needs of the production department. He comments: “If protein purification and up/downstreaming are explained to employees who are not familiar with biotechnology, the production error rate falls. These employees also recognize the skills of their colleagues and later on know who to approach for help.”

Matthias Kaiser took the course to learn both the theoretical and practical aspects. He notes: “It expands your general knowledge and you understand the complex processes.” He regards the personal connection that results from overnighting away from home and having meals together as a benefit to Roche: “On the evening before the examination we gave each other test questions. This wasn’t planned, it just happened”, he remembers with a smile.

Savina Maiolo, who did her apprenticeship in chemistry and pharmaceutical technology at Roche, wanted to go on the course as soon as she heard about it. Savina, who works in fermentation, explains: “We had biotech as an option during the last year of our apprenticeship. I enjoyed the combination of theory and practice.



Participants in the Upstreaming and Troubleshooting course celebrate the successful completion at ZHAW Wädenswil. Photo: ZHAW Wädenswil.

During the day we were working with scientific assistants and students, but in the evening we could chat and socialize together.”

Learning and Applying New Knowledge

Frank Trach, Head of Production Enabling Basel Biotech Manufacturing, is convinced: “The Roche course is vital in ensuring that employees with very different technical backgrounds speak the same language. The ZHAW researchers worked with us to tailor it to our requirements. Another thing that reflects the quality of our partnership with ZHAW is the fact that we constantly host excellently trained undergraduate and postgraduate students from Wädenswil.” He sees the social contacts as an important benefit. Some of the people who took the pilot course in 2005 are still in touch today.

“That’s right!” confirms **Angelo Castioni** who works in the Tagesteam Technik and attended the first course, “the social network from way back then is still working today.” His eyes light up as he tells us: “In 2005, Building 95 (Avastin production) was still being built, and we were sort of thrown in at the deep end. The course gave us valuable insights and Roche involved us in the development of the building. We were able to play an active part and put forward ideas, which would not have been possible without the course.” He sees it as important that employees have some freedom, are taken seriously, and that Roche invests so much in training. He is particularly pleased that there is still a

regular exchange of views with lecturer Regine Eibl. “The joint venture with ZHAW Wädenswil is a model for how a university of applied science and an international corporate group can complement each other and solve a problem together in what is a win-win situation.”

A key element in the success of the course is that it has the support of Roche’s management, and that investment in human capital is a defined strategy of the company. As Marco Bembo comments: “It is important to have your sights on a goal when it comes to training. You need experts with great sensitivity, who can take participants forward from where they currently are, and that’s been our experience with ZHAW Wädenswil.” Employees who have a better understanding of their work are more innovative and committed, and have greater job satisfaction. And job satisfaction is still the key to outstanding performance. As such, the ‘Roche course’ is a model for other disciplines!

Websites:

www.roche.ch

www.biotechnet.ch

<http://www.ibt.zhaw.ch/bioverfahrenstechnik>

<http://icbc.zhaw.ch/de/science/institute-zentren/icbc/fachstellen/biochemie.html>

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