

Automating the development of aptamer-based biological tools

The Institut Européen de Chimie et Biologie is investigating a variety of innovative aptamer-based applications, and depends on two Freedom EVO® platforms for reliable automation of its selection and production processes.

The Institut Européen de Chimie et Biologie (IECB) in Bordeaux, France, is home to a number of interdisciplinary research teams operating under the joint authority of the National Center for Scientific Research (CNRS), the French National Institute of Health and Medical Research (Inserm) and the University of Bordeaux. IECB scientists in the ARNA Laboratory are working at the interface between molecular biology, molecular biophysics and chemistry, using aptamers to perform both fundamental and applied medical research. These single-stranded DNA or RNA oligonucleotides can bind to pre-selected targets – including proteins and peptides – with high affinity and specificity, providing opportunities for the development of novel tools for biological applications. To increase throughput, the ARNA Laboratory has automated

its procedures on two Freedom EVO platforms, as Inserm Research Director Dr Jean-Jacques Toulmé explained: “Our team focuses on the design, selection and characterization of aptamers for in-house projects – for example, artificial regulation of viral or prokaryotic gene expression – and the development of various aptamer-based tools for applications such as imaging tumors and the design of biosensors. In addition, we have a strong emphasis on technology transfer for practical applications, as well as providing aptamers for other academic groups or external companies from various industries for their own applications. We have been working in this field for almost 20 years now, pursuing both upstream fundamental research and the more applied technical development of practical applications.”

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The laboratory's Freedom EVO platform has a range of integrated devices to offer almost complete automation of its workflow



The ARNA Laboratory team

Jean-Jacques continued: “Our association with Tecan and the implementation of the Freedom EVO workstations in our laboratory began around 10 years ago when we came across a paper describing an automated selection platform. We decided to automate our selection protocols to allow us to screen large libraries of oligonucleotides, and contacted various suppliers before choosing Tecan. After a lot of discussion with the company, we invested in a Freedom EVO platform with an integrated incubator, Te-VacS™ magnetic separator and PCR system, enabling the process to be almost completely automated. We generally perform two selections in parallel – either two different targets, or two different conditions for the same target – which is usually between 8 and 15 runs. With each run taking around six hours, the selection process is completed in about a week to 10 days. This would be a difficult and time-consuming process to do manually, and is a tedious, repetitive task for a scientist to carry out. The Freedom EVO is a great benefit, freeing up staff time and helping us to achieve the desired throughput.”

“About five years ago, we realized that we needed a second automated platform for our production processes, and it was

natural to turn to Tecan. We discussed the best configuration for this new workstation and decided to incorporate a fluorescence detector, choosing the Infinite® M1000 PRO multimode reader. This gave us the capability to use additional techniques, including AlphaScreen® assays and fluorescence anisotropy, which was essential as we wanted to screen candidates by function, rather than the more commonly used affinity assays. Automation allows us to quickly and easily screen large numbers of different candidates against our targets. We design our assays according to the function that we want to detect and, in contrast to the standard procedure where perhaps 100 candidates are sequenced, we blindly produce three 384-well plates containing hundreds of candidates. These candidates are then screened using the Infinite reader. Fluorescence anisotropy is our preferred screening method, as it simply requires the use of a fluorescently-labeled target or oligonucleotide candidate, eliminating the need for magnetic beads and giving good reproducibility.”

The growing interest in aptamers has led to the creation of a technology transfer unit – Novaptech – to facilitate

commercial development of these molecular tools. Using the same Freedom EVO-based automated workflow as the ARNA Laboratory, Novaptech focuses on the identification and characterization of aptamers for analytical and diagnostic applications, performing both collaborative projects and screening services for academic laboratories and biotechnology companies around the world. Jean-Jacques concluded: “The Freedom EVO platforms and the Infinite reader are easy to operate, and we can do all the script programming in house. Our staff are really happy with the systems and the software. We have had some interesting contributions from Tecan, and everything is working very smoothly.”

To find out more about Tecan’s protein purification and characterization solutions, visit www.tecan.com/proteinscience

To find out more about the Institut Européen de Chimie et Biologie, visit www.iecb.u-bordeaux.fr

To find more about Novaptech’s services, visit www.novaptech.com