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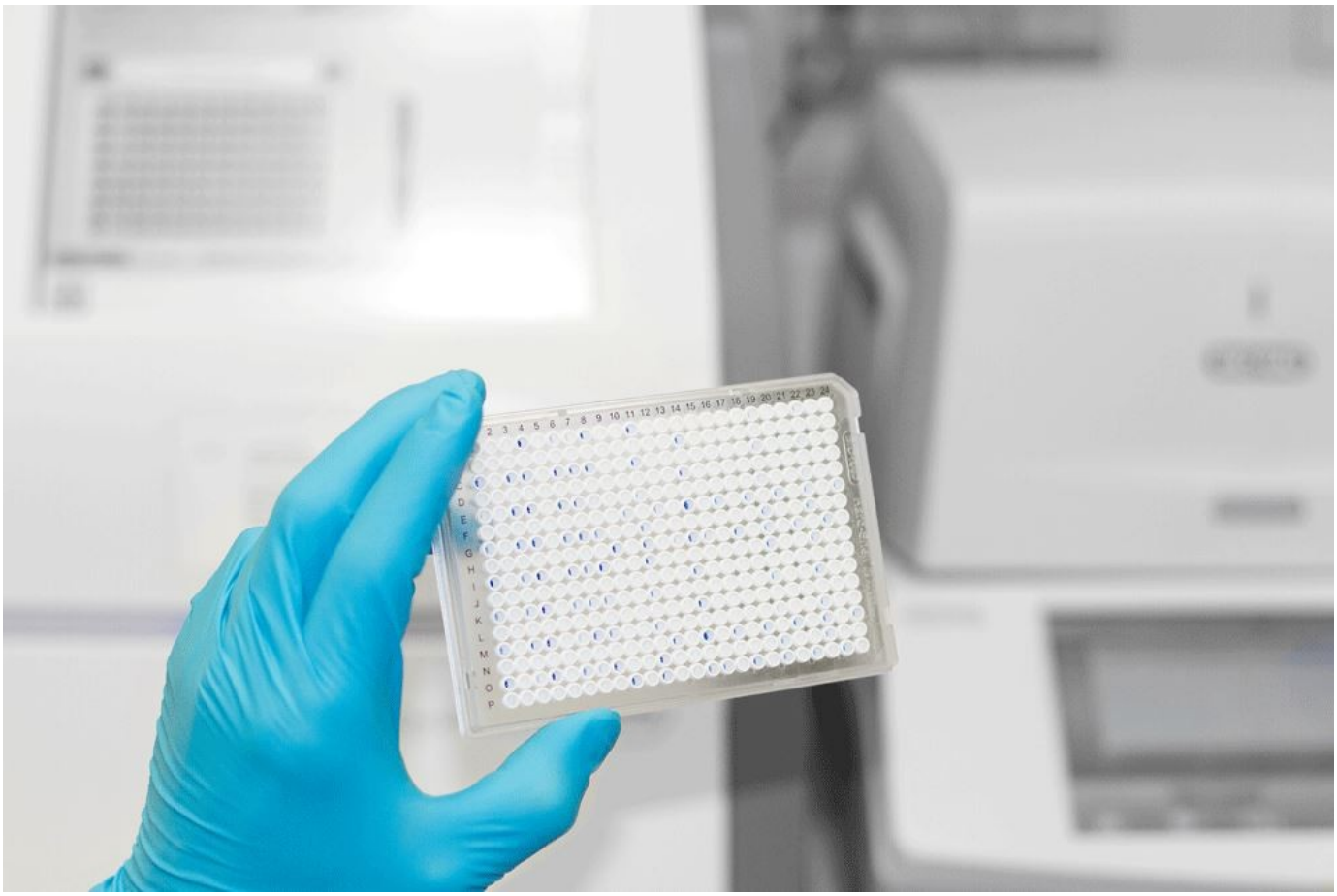
Healthcare industry BW

myPOLS Biotec UG - made-to-measure enzymes for diagnostics and research

The company myPOLS Biotec UG, a spin-off from the University of Konstanz, specializes in services involving DNA and RNA polymerases and creates artificial enzymes by evolution in test tubes. These next-generation polymerases can be used for many research and diagnostics applications. myPOLS Biotec's polymerases are promising enzymes for future applications with the potential to make the detection of pathogens and DNA analysis faster and easier.



myPOLS Biotec uses processes known as directed evolution to create enzyme variants with specific characteristics for use in specific applications.

DNA and RNA polymerases are the standard tools of any molecular biologist and they create DNA and RNA molecules by assembling nucleotides. They are a prerequisite for the study of genetic material and are integral components of applications such as PCR, sequencing and cloning. Naturally occurring polymerases have been used for biotechnological applications for many decades and their action has been optimized through improvements to the reaction conditions. However, this optimization is rather limited. There is therefore a growing need for specialized, more efficient polymerases. "Nature has not optimized enzymes for use in the laboratory, but we are quite able to do so," says Dr. Ramon Kranaster, managing director of myPOLS Biotec. The Konstanz-based start-up company develops polymerases for a broad range of applications, such as for example the identification of pathogens, DNA and RNA testing and forensics.

Time-lapse enzyme evolution

myPOLS Biotec uses nature as an inspiration for the development of novel polymerases, using the artificial, directed evolution method to generate gene variants by randomly mutating the gene that encodes the enzyme of interest. "What we basically do is perform the process of evolution at high speed by introducing several mutations in the enzyme-coding gene," says the company founder explaining that random mutagenesis involves the use of error-prone PCR, a method with which random nucleotide mutations can be introduced into a DNA molecule as it is synthesized. This enables the creation of a library of enzyme variants whose properties differ in relation to the effects of the mutations introduced. This mutant library will subsequently be screened for enzymes with the sought-after function.

Any mutant enzyme that fulfils the desired function better than the previously used wild-type enzyme, is subjected to another cycle of mutation and selection. “This is repeated until an enzyme with the best characteristics is found,” says Dr. Kranaster explaining the method which he has co-developed.

Direct identification of influenza viruses and DNA modifications

One of the first products developed by myPOLS Biotech was a thermostable DNA polymerase which also has an artificially generated reverse transcriptase activity. This enzyme can therefore be used for the direct analysis of RNA, without requiring the reverse transcription of RNA into cDNA in a separate step. “This makes the application of the enzyme easier and quicker than standard transcription analysis systems or systems that enable the detection of pathogens such as influenza viruses and noroviruses,” says Ramon Kranaster highlighting the advantages of their novel polymerase. In addition, this DNA polymerase is very robust; it remains stable at high temperatures and can be dispatched and stored at room temperature. Conventional polymerases require complex cooling and storage.

In addition, the enzyme can be directly mixed with the sample under investigation. The sample, e.g. saliva or blood, does not need to be specifically prepared, which tends to be rather a time-consuming process. The company’s enzymes open up new possibilities for application in the field of medical diagnostics where very accurate and reliable analyses are required. For example, the modification of a single nucleotide can determine whether a person develops a genetic disease or not or whether he or she tolerates or responds to certain drugs. A natural, wild-type DNA polymerase is unable to detect such a small DNA change. “We have developed a high-fidelity DNA polymerase which is particularly well-suited to the analysis of single nucleotide exchanges, so-called SNPs,” says Dr. Kranaster. This polymerase recognises mispaired nucleotides present on a primer-template complex, thus preventing the synthesis of a new DNA strand.

In addition, the company is also working to make PCR-based laboratory analyses simpler and quicker. “We are developing inhibitor-resistant, directly applicable polymerases for the PCR of primary samples such as whole blood, saliva and yeast cultures,” says Kranaster highlighting his company objectives. The versatility of the novel polymerases is also reflected in myPOLS Biotec’s clients. “We are seeing growing interest from various fields of research, diagnostics and veterinary medicine,” says Dr. Kranaster. After successfully setting up the company and many comparatively small sales deals, Kranaster and his colleagues are currently negotiating a larger research deal. “In addition to our standard products, we also offer our clients customized enzyme mixtures and are always open to cooperating with others,” he explains.

From science to business with regional support

Dr. Ramon Kranaster is the managing director of the Konstanz-based start-up company myPOLS Biotec that develops novel polymerases for application in diagnostics and research.

myPOLS Biotec is a spin-off from the University of Konstanz, more specifically from the research group on artificial protein evolution headed up by chemist Prof. Dr. Andreas Marx. At conferences, Professor Marx was repeatedly asked whether his polymerases could be purchased. He eventually decided to establish a company, but it was still a long process from initial business idea to the actual setting up of the company in April 2014. Suitable partners had to be found that were prepared to take the risk of helping establish the company.

The young company is located in the Centre for Chemical Biology at the University of Konstanz. "We are very grateful to the University for their support during company establishment," says Ramon Kranaster who had done his doctoral work in Professor Marx's laboratory. Thanks to long-standing links with the region through studies and research work, the company founders contacted the regional life sciences BioLAGO network very early on in the company establishment phase. BioLAGO provided advice on funding, which resulted in a successful grant application. In addition, the company founders were also able to contact other companies in the BioLAGO network. "The BioLAGO platform helped put us in contact with medical laboratories in the area, who tested our enzymes. And this was very helpful for us," says Kranaster.

Further information

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Bioanalysis – techniques for the characterization of biological material


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