



A jump start for nucleic acid processing

The ever-increasing throughput and ever-decreasing cost of next generation sequencing have made this technology a practical and affordable solution for everything from molecular diagnostics and antimicrobial susceptibility testing to crop research and environmental monitoring. For many of these applications, the bottleneck in the workflow – which can account for considerable hidden costs – lies in sample extraction. Tecan has partnered with Zymo Research to offer labs an automated and optimized solution for nucleic acid processing.



NGS has made the transition from a research tool to a routine testing technique over the last decade or so, but pre-analytical sample handling remains a challenge for many labs. The way samples are processed can dramatically affect sequencing results, requiring careful standardization and

optimization of workflows to achieve efficient, unbiased extraction. Founded in 1994, Zymo Research has been offering solutions to aid nucleic acid processing (NAP) since the early days of NGS. Ryan Kemp, Director of Nucleic Acid Solutions at Zymo Research, explained: “The company was originally created to exploit a number of proprietary yeast technologies, but we quickly moved into nucleic acid purification, and became well known for our epigenetics offerings. Working side-by-side with many labs performing NGS meant that we could see a need

for improved sample collection and extraction, so we began developing kits for everything from blood and urine to feces and soil samples.”

“This eventually led us into the microbiome space, where we discovered that inherent bias in extraction techniques and a lack of standardization between methods could result in more than ten-fold differences in measurements. We therefore created a suite of products aimed at improving accuracy and consistency for this fast-growing area, including the development of the first commercially available mock microbial community standards, designed to assess the bias and sensitivity of workflows in microbiomics and metagenomics studies. This was an important development for the field, allowing labs to compare the results from their workflows and protocols to a qualified microbiome profile.”

“Consistency is essential for any pre-sequencing sample preparation workflow, helping to ensure reproducible and reliable results. Optimized, precise sample processing is even more important for applications such as microbiome analysis or environmental testing, where sample volumes are often very small, and microbial titers are even smaller. In these circumstances, even slight contamination or small variations in sample processing can lead to significant unintentional bias, making NAP an ideal candidate for automation.”



The Fluent Automation Workstation is now an integral part of Zymo Research's service lab workflow

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The recently launched DreamPrep™ NAP workstation has been created specifically to simplify nucleic acid extraction workflows, and Zymo Research has worked with Tecan to create optimized, automated protocols for a number of Zymo Research extraction kits, including the ZymoBIOMICS™ 96 MagBead DNA Kit for microbiome studies. Ryan continued: “Our goal was to provide a solution that simply and reliably purified NGS-ready nucleic acid. Tecan’s specialists worked side-by-side with us to streamline and parallelize the workflow as much as possible, combining our knowledge of the chemistries and downstream workflow with their liquid handling and programming expertise to create an extremely fast, robust protocol. We chose a modular approach to developing the scripts, which ensured reliable operation and allowed easy transfer or adaptation. We used a Fluent® 1080 for development, then transferred the scripts to the DreamPrep NAP, which is based on the smaller Fluent 480 workstation. This was very straightforward and proved to be a good test to demonstrate both the robustness and flexibility of the modular approach.”

The throughput and consistency offered by the automated, modular workflow are now benefitting customers of Zymo Research’s NGS services business, as well as those using its extraction kits. Dr Keith Booher, Services Projects Manager, explained: “We were already using some automation in our service lab, but the diversity of sample types we receive – blood and tissue samples, cell culture pellets, plant specimens, etc. – meant that we were performing most of the extraction by hand, due to the variety of different extraction protocols required. As this side of the business has grown, it was logical to look at automating this portion of the



Ryan Kemp, Director of Nucleic Acid Solutions at Zymo Research



Dr Keith Booher, Services Projects Manager at Zymo Research

workflow, and we could see from our experience collaborating on the DreamPrep NAP protocol development that the Fluent offered the versatility we required.”

“Starting with the modular scripts co-developed with Tecan, we have now implemented a wide range of our DNA and RNA extraction kits on the platform, which provides very good purity and yields,” Keith continued. “The guided workflow means that one person can easily process many samples in a day, without the need for specialist training. It is also very reliable, which is important when your customers have trusted you with their precious samples. I was even pleasantly surprised that the results are more reproducible than when the extraction is performed manually by an experienced technician.”

The benefits provided by automation have also contributed to the global fight against SARS-CoV-2, offering a straightforward sample preparation workflow for high throughput testing. Ryan added: “Alongside the ZymoBIOMICS kit, one of the first kits we chose to develop scripts for was the Quick-DNA/RNA™ Viral MagBead Kit, which really came to the forefront when

the COVID-19 pandemic spread across the globe. Although we are a Research Use Only company, this kit is well suited for extraction of both the nasopharyngeal and oropharyngeal swab samples used for molecular diagnostics. Being able to automate the extraction is obviously essential for the type of high throughput testing required in a pandemic, and the modular approach we took when scripting the DreamPrep NAP workflows has made it much easier to rapidly implement testing on other Tecan platforms. We have even been able to transfer the workflow to a number of Freedom EVO® workstations fairly easily, despite the differences in the two platforms’ software, because of the way the scripts were developed.”

To find out more about Tecan’s DreamPrep NAP workstation featuring Zymo Research, visit www.tecan.com/dreamprep-nap-workstation

To learn more about Zymo Research, go to www.zymoresearch.com