

Futureproofing biobanking procedures



The Heidelberg CardioBiobank – part of Heidelberg University Hospital – collects thousands of patient samples every year for cryostorage and use in national and European medical research projects. Since moving from the main hospital campus into a new, purpose-built facility, the biobank has established a state-of-the-art automated workflow to improve the throughput, quality and consistency of its sample processing, helping to drive forward large-scale cardiology studies across Europe.

Biobanks have played an increasingly prominent role in medical research over the last two decades, supporting a wide

range of studies aimed at improving the diagnosis and treatment of numerous conditions. As our understanding in many fields – such as cardiology and oncology – has increased, many institutions have also established disease-specific biorepositories to complement the general population biobanks. One such facility is the Heidelberg CardioBiobank at Heidelberg University Hospital, Germany. Part of one of the largest internal medicine departments in Europe, it is perfectly positioned to recruit participants for a wide range of clinical studies, such as the investigation of novel disease biomarkers. Dr Tanja Weis, Head of the Heidelberg CardioBiobank, explained: “Our main focus is the collection and preparation of high quality biological samples – predominantly from patients with heart muscle diseases – which are

then kept in cryostorage until required for clinical or molecular studies, either in house or by external partners. We are also a core biobank for many large-scale projects and international consortia, including the European FP7 ‘BestAgeing’ consortium, the European Horizon 2020 ‘NISCI’ collaboration, and the German Centre for Cardiovascular Research’s TORCH (translational registry for cardiomyopathies) registry. In addition, we collaborate with biobanks worldwide on issues such as collection techniques, sample and quality management, and the development of SOPs and analytical processes.”

The increasing focus of genomics and personalized medicine in many medical specialties means that the Heidelberg CardioBiobank is now responsible for the preparation and storage of over 100,000 patient sample aliquots annually. This increasing workload has meant that many of the routine sample processing activities – which were previously performed manually – have now been automated, significantly increasing the speed of its protocols, as well as enhancing the yield and quality of DNA extracted. Tanja continued: “The biobank was established about eight years ago with just a few -80 °C freezers and liquid nitrogen tanks, which rapidly grew to around 70 freezer units! However, these occupied a great deal of space and took a lot of effort to maintain. Automation became essential and so, when the biobank moved into a purpose-built laboratory on the university’s life sciences campus two years ago, we installed a fully automated LiCONiC STC cryostore with the capacity for 1.2 million samples. At the same time, we invested in a Freedom EVO®-HSM workstation for



The Heidelberg CardioBiobank team

ReliaPrep™ DNA purification*, taking advantage of the partnership between Tecan and Promega to implement automated large volume DNA extraction.”

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“Implementation of the system went very smoothly. After Tecan had completed the installation, a Promega specialist visited the biobank and, in two days, had commissioned the system and trained four of our staff to use the platform, which is supplied with pre-installed, validated protocols. Unlike other suppliers, Promega demonstrates the performance of the DNA extraction during site acceptance testing with a unique biological acceptance test (BAT), using specific, well characterized blood samples to provide a precise, clearly defined reference point. We also validated the system using samples from the biobank and, within a week, were routinely using the workstation. It has been in use every day since then.”

“Previously, DNA was manually extracted using standard kits from a range of providers. Although this worked, it was time consuming and not as effective as the automated process in terms of quality and quantity. The

Freedom EVO-HSM’s straightforward touchscreen operation guides the technician through setting up and starting the run, leaving them free to carry out other tasks while the automated extraction is performed.

The step-by-step instructions also mean that less experienced technicians can be taught to use the platform within just a few hours, if necessary, without affecting the results.”

“We currently extract samples from 32 patients per run in about four hours, giving us a throughput of up to 64 samples a day for a normal eight hours operation, with a maximum of 192 extractions per day for 24-hour use. This has increased the speed of extraction by a factor of at least 10, perhaps more; the system will pay for itself within a short time. In addition, the yield and quality of the DNA extracted has significantly improved, which is an unexpected but very welcome benefit.”

“The next bottleneck in our workflow was sample aliquoting. When performed manually, this is a slow, repetitive process with the potential for human errors, and so we have also invested in a Freedom EVO 150 workstation to automate these laborious activities. We currently run about 20 separate protocols on the platform, giving us the versatility to aliquot different sample types – including blood, serum, plasma, urine and cerebrospinal fluid – for a wide range of studies, and virtually eliminating human errors. All our technicians find it very easy to operate the system, and to write specific scripts for individual studies. The Tube Inspection Unit (TIU) is a big advantage, helping to enhance the performance of the system, and we

also use the excellent 3D simulation tool a lot, enabling any potential problems such as a mechanical collision to be identified and resolved before starting the run.”

“There were many reasons for choosing the Tecan workstations, including quality, performance, reliability, durability and robustness in daily operation, and especially the partnership with Promega. The systems give us the flexibility to adapt our processes as our needs change, futureproofing our procedures, and are also compatible with the new LIMS system due to be implemented, which is crucial. In addition, I have confidence that the systems will be supported for many years, and know that I can communicate directly with local technical experts if I need to, which is invaluable,” Tanja concluded.

To find out more about Tecan’s Freedom EVO-HSM workstation, visit www.tecan.com/reliaprep

To learn more about the Heidelberg CardioBiobank, go to www.heidelberg-cardiobiobank.com

* For research use only. Not for use in clinical diagnostics.