

Rapid, automated isolation of buffy coat benefits DNA extraction

Tecan and the Integrated BioBank of Luxembourg (IBBL) have successfully co-developed an automated platform for buffy coat extraction based on a Freedom EVO® 200 workstation, relieving scientific staff from this time-consuming task and significantly increasing the yield of DNA.



Biobanks such as the IBBL have a vital role to play in modern medical research, providing high quality biospecimens, as well as the technology and scientific expertise to enable researchers to evaluate data against medical records and environmental factors. The IBBL was established following a 2008 Government agreement to form a strategic partnership with three US research centers – the Translational Genomics Research Institute (TGen), the Institute for Systems Biology and the Partnership for Personalized Medicine. Working closely with the Luxembourg Personalized Medicine Consortium (PMC), the IBBL collects, stores, and analyzes biological samples and associated clinical

data, from neighboring countries as well as Luxembourg itself, which are then made available to research organizations. In addition to somatic disease collections for cancer, type 2 diabetes and Parkinson's disease research, there is also a normal population cohort collection from healthy people – a collaboration with CRP Santé – that acts as a control.

Today, through its own investigations and partnerships with internationally recognized research centers, the IBBL's world-class scientists are at the forefront of innovative biospecimen research. Fay Betsou, Chief of Biospecimen Science at the IBBL, commented: "Research often tends to focus on biomarker identification and validation rather than specimen validation, but this is a basic critical issue that could completely invalidate experimental results. Innovative biospecimen research is a very important – yet extremely rare – initiative that is quite specific to the IBBL."

The IBBL's biospecimen collection and biorepository contain high quality tissues and body fluids, maintained according to strict quality requirements. The associated biorefinery analysis and research service produces high quality analytes, such as DNA, RNA and protein, maintains technology for high throughput gene sequencing and gene expression, and conducts biospecimen research. In addition, an informatics platform securely maintains clinical and biospecimen data.



Conny Mathay explains the biobanking process to students studying for the University Certificate on Principles of Biobanking

A key target biospecimen for IBBL and many biobanks and diagnostic laboratories is the buffy coat, the layer of leukocytes and platelets that forms when unclotted blood is centrifuged or allowed to stand, and is often used for DNA extraction. Traditionally, the process of manually isolating the buffy coat from whole blood is slow, tedious and very dependant on the skill and dexterity of the technician separating the layers. To eliminate this time-consuming and variable element of sampling, the IBBL and Tecan joined forces to co-develop an automated procedure on a Freedom EVO 200 platform.

Fay explained: "Our sample throughput, although relatively low at present, is expected to increase five-fold in the near future, and we were initially looking for a flexible liquid handling system that could meet this demand. We also have particularly strict requirements



Fay Betsou, Chief of Biospecimen Science at the IBBL

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The IBBL team with the Freedom EVO

in terms of time; it is crucial to minimize the delay between sample collection and freezing, and speed is essential. We looked at the existing options and spoke to several different suppliers before choosing Tecan. From the beginning, we could see that as well as performing classical liquid handling, there was a real possibility of automating buffy coat extraction using the Freedom EVO. This was never going to be an easy process, largely because of the variation in individual sample volumes and the quantity, viscosity and texture of the buffy coat layer itself, but we had several meetings with Tecan's technical teams and, over the next couple of months, worked together to co-develop an automated method."

All of the IBBL's blood samples initially have a hemocytometer count and CRP measurement performed to generate basic background data such as blood cell count and inflammatory status. Centrifuged blood

collection tubes are placed on the Freedom EVO platform, which is equipped with Robotic Manipulator (RoMa), eight-channel Liquid Handling (LiHa) and Pick and Place (PnP) Arms, a Tube Inspection Unit (TIU), an Xtr-96 flatbed scanner (FluidX), Xsd-96Pro and Xsd-48Pro modules (FluidX), and a BDK module to provide HEPA-filtered air on the worktable. The workstation, which is also used for aliquoting serum, plasma and urine, has been optimized to maximize the yield and quality of the buffy coat, and to minimize the risk of cross-contamination. Tubes are transferred to the TIU, which identifies the position of the buffy coat layer using a laser beam. The buffy coat is then aspirated by the LiHa using a spiral movement, and transferred to its destination tube. "The LiHa pipettes the buffy coat layer with very precise orientation and speed, standardizing the process and eliminating technician-to-technician variation," Fay added.

During the validation process, IBBL found the automated system gave a purer buffy coat product with less contamination from red blood cells and hemoglobin and a similar distribution of white blood cells, as well as an average DNA yield significantly higher than that obtained by manual extraction. "The results are amazing; the yield is 10-15 % higher using the automated process. Altogether, isolating the buffy coat manually is a tortuous task but the Freedom EVO system now processes 24 samples in just 16 minutes. We are very satisfied with the system and are looking forward to working with Tecan on another biospecimen research project in the near future," concluded Fay.

To find out more about Tecan's biobanking solutions, visit www.tecan.com/biobanking

To find out more about IBBL, please visit www.ibbl.lu