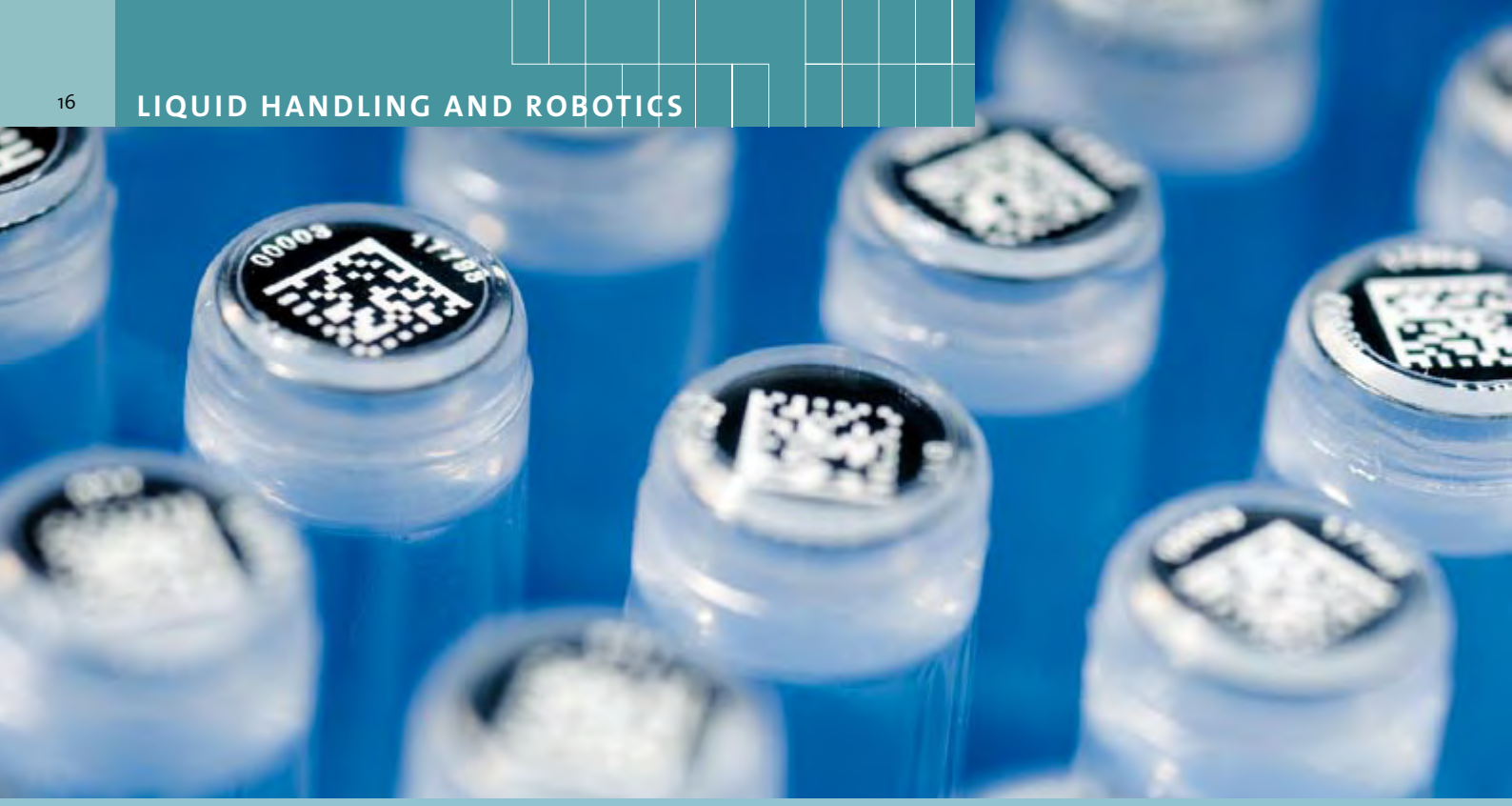


Processing 15 million aliquots to support future medical research

UK Biobank is using 11 Freedom EVO® liquid handling workstations to process thousands of samples each day in preparation for a long-term initiative aimed at improving the prevention, diagnosis and treatment of a wide range of serious and life-threatening illnesses, including cancer, heart diseases, diabetes, arthritis and forms of dementia.

Launched in April 2007, the UK Biobank is a major UK medical research initiative based in Manchester and set to develop an extensive resource for long-term medical studies. Over the next four years, UK Biobank will be recruiting 500,000 UK residents, aged between 40 and 69. Detailed information about lifestyle, work, health and medical history will be collected from each volunteer, along with consent for access to the participants' hospital and general practitioners' medical records throughout their life. Basic physical parameters like weight, height, blood pressure and lung function will also be recorded, and blood and urine samples will be taken from the volunteers.

"Over the course of 10 to 20 years, subsets of the 500,000 people will suffer from different diseases, and UK Biobank will have a package of information, together with blood and urine samples, which can be made available to research groups in various disease areas," explained Paul Downey, Director of Operations of UK Biobank. "Two of the key strengths of UK Biobank are the sample size and the large amount of health information we are collecting on participants. These make UK Biobank the most detailed study of its kind ever undertaken."

An efficient processing system is absolutely essential to handle and store so many blood and urine samples. Paul described the sheer scale of the task: "Six tubes of blood and one tube of urine are collected from each participant, and shipped overnight to our central facilities in Manchester to be processed the following day. The seven tubes are split into 28 tubes for storage so, with

an average daily target of 600 to 800 participants, we create roughly 20,000 1.4 ml tubes each day, and 15 million over the duration of the whole project. There were two key issues in the selection of a system to process these samples, the first of which was the reliability and throughput required to process 20,000 tubes in a day. This was critical because another 3,500 Vacutainer® collection tubes, resulting in 20,000 storage tubes, arrive each day and, as a labile substance, blood must be processed within 24 hours of collection. The other key consideration was the data audit trail, ensuring full traceability of all samples using barcodes and supported by a LIMS. After looking at several liquid handling systems, we are confident that we have chosen the system that best addresses these issues."

The system at UK Biobank has 11 Tecan Freedom EVO liquid handling workstations integrated with various modules, such as barcode scanners and full storage hotels for tube plates, to achieve fully automatic processing of the different blood and urine tube types. Some of the workstations are automated within laminar flow cabinets to maintain sterility of some blood samples that may be used to prepare immortalized cell lines. Once the blood or urine tubes are loaded, the entire process is automated. The system identifies the sample tube type by its barcode, decaps the tube and aliquots the various blood or urine fractions into smaller, 2D-labeled, 96-well format storage tubes. The samples are stored at two geographically separate sites so that even if a catastrophic event at one site destroys the stored samples, the samples of any participant would not be completely lost. Two workstations have been designated for each sample type, so that there is effectively a running standby to ensure that the daily throughput can be achieved even if one platform is out of operation.

"The systems will be undergoing ISO 9001:2000 accreditation, which means that the new set-up on altered production systems needs to be validated before resuming live production, and having two of each system type allows us to do that without any downtime. Because of this strategy, combined with good reliability and efficient service from both the local service engineer and the Tecan Integration Group (TIG), we have never been left in a situation where we can't process samples."

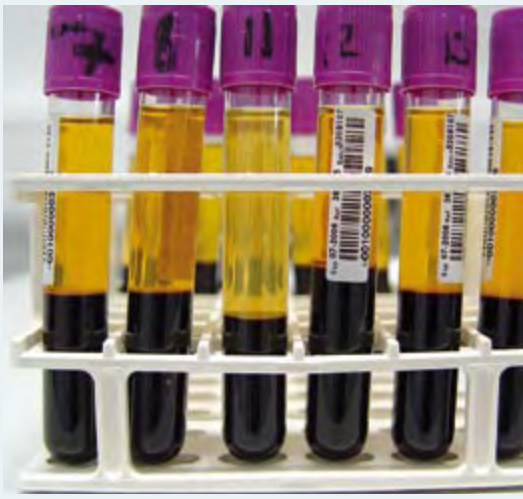
"The systems were integrated by TIG in Switzerland, and I was very impressed with their slick and professional management of the project from order to delivery. The systems were installed in stages so we have had them for between 12 and 18 months, and we have been very happy with their performance and reliability. We performed a pilot study last year to demonstrate that the project was viable, after which we gradually put the facilities and infrastructure in place before starting the project in April."

"Currently we are ramping up the throughput and will have six or seven regional assessment centers recruiting participants around the country by the end of this year. We have just opened our third assessment center so are at around 50 % of our anticipated capacity, but I don't see any major problem in increasing and sustaining the target daily throughput – the capacity is in place and the early signs are that everything will be fine." Paul concluded: "I think, on balance, the project has had a really smooth start and I see it continuing that way."

Vacutainer is a registered trademark of Beckton, Dickinson and Company.

Loading sample tubes onto the Freedom EVO workstation

Barcoded tubes of blood samples



Close-up of the tubes after centrifugation