Te-PoolSafe™ boosts pipetting accuracy for testing donor blood

The German Red Cross Institute in Frankfurt is responsible for screening thousands of donated blood samples every day for blood banks in Germany and further afield. Scientists at the Institute have developed high throughput PCR-based testing methods to screen for a number of viruses, and samples are pooled prior to screening using three Tecan liquid handling workstations. In 2006, the Institute worked with Tecan to validate the recently launched Te-PoolSafe™ option for monitoring pipetting during pooling.

Dr Kai Hourfar at the Red Cross Institute.

As one of the first laboratories to use PCR for testing donated blood, the German Red Cross Institute in Frankfurt, Germany, was an ideal candidate for perfecting Tecan's new pipette monitoring module in a rigorous diagnostic setting. Dr Kai Hourfar, deputy of the Blood Donor Screening Lab, said: "We demonstrated years ago that PCR testing of blood samples saved lives, because we had cases where some samples were PCR-positive for viruses, even though antibody tests of the same samples were negative. Because we were pioneers and still have a very good reputation for this application, many institutes from other countries asked us, and continue to ask us, to perform PCR testing on their behalf. The challenge to begin with was that there was no automation for PCR testing, and the only feasible way to test the large numbers of donations was to create mini pools of the samples. We had worked with Tecan previously when developing our serological tests, and decided to choose Tecan instruments again to automate pooling for PCR."

The Institute initially acquired a Genesis RSP™ liquid handling workstation for pooling the samples, followed more recently by two Genesis Freedom® workstations. All three workstations are dedicated to pooling the thousands of samples that the Red Cross Institute receives each day.

"We create pools of 96 donations, which means that if we receive 1,000 samples per day then we reduce these samples to ten pools and only need to perform ten PCRs for each parameter being tested," Dr Hourfar explained. "We include enrichment procedures in our method and always use positive controls with our screens to ensure that our testing is sufficiently sensitive, and this approach allows us to meet the strict testing criteria defined by the Paul Ehrlich Institute." The pooled samples are subjected to PCR and serological tests simultaneously, as platelets are only useful for a maximum of around five days, and this approach clears a unit of blood for release just one day after donation. Blood samples arrive at the Red Cross Institute at night, so pooling begins at 11:00 pm and is normally finished by 6:00 am the following day, ready for the technicians to begin subsequent procedures. Samples from first-time donors are always pooled separately, because these samples have not been previously screened. However, the incidence of positive results during testing at the Red Cross Institute is extremely low.

"All the samples are barcoded and managed by our LIMS software, and we have several safety measures in place to prevent any mix-up of the sample identities," said Dr Hourfar. "Most institutes that we test for send us a list of the samples they are sending and we compare the tubes we receive with this list to make sure none are missing or duplicated. If two samples arrive with the same barcode, for example, then both donations will have to be discarded."

Safety precautions are vital in any diagnostics laboratory and, in 2006, Tecan launched the Te-PoolSafe option, a liquid arrival check system based on weight measurement, that allows blood banks and nucleic acid testing laboratories to monitor and evaluate the performance of their pooling application. The module ensures full sample traceability and provides documented proof of performance, leaving users confident that the appropriate amount of liquid has been pipetted from each sample into the pool. This is a very fast and sensitive balance with a 16-position tube holder and it is supported by software that measures and evaluates each dispense from primary samples to the sample pool, to confirm liquid arrival. Results are displayed to the system operator or, alternatively, may be transferred to the LIMS for automated processing. Inaccurately dispensed samples are selectively identified and can be separately re-pipetted.

Dr Hourfar and his colleagues performed a number of validation studies for the Te-PoolSafe on behalf of Tecan[1], and were impressed by the module's potential to improve monitoring and documentation during blood pooling.

"We have pooled well over 5,000,000 donations since we first started testing at the Red Cross Institute and any additional safety measures, such as the visual inspection of archive plates to verify automated safety features, will always be important," Dr Hourfar explained. "It is critical that we do everything we can to ensure our pooling procedures are safe and it is becoming increasingly necessary in diagnostics laboratories to prove these safety measures are adequate. The Te-PoolSafe provides valuable documentation to show that all blood pooling steps are accurately performed."

The Te-PoolSafe option has not been cleared for use in all countries. Contact your local sales office for specific information.

Reference:

1. Hourfar MK, Koller M, Roth WK, Kehrli R, Seifried E, Schmidt M. (2007). Balance module allows consistent monitoring and documentation of the pooling process for NAT-testing. *Vox Sanguinis* (in press).

Balancing samples with the Te-PoolSafe.