Automated blood pooling ensures safe PCR diagnostics

The Blood Donor Center in Halle, Germany, is using the Freedom EVO® Clinical 150 with integrated Te-PoolSafe™ module for safe and reliable automated pooling of blood for subsequent PCR-based testing, ensuring that blood products are free of infection.

The team of the laboratory from left to right: Susan Glaser, Katrin Kahle, Amelie Bolte, Heidrun Busch and Angelika Stöcker

The constant availability of blood for transfusions is essential for saving lives, not only of people who suffer serious accidental injuries, but also of patients undergoing surgery – a thoracic operation, for example, can require 20-30 units of blood. Blood is truly a critical commodity because, at present, there is no artificial alternative to human blood collected from blood donors. To compound this problem, blood donors, who are already in short supply, undergo a rigorous selection process, so every single donation is precious. Patients are dependent on thorough blood testing to ensure that the blood they receive is free from infections and pathogens, so it is vital that testing results are accurate and unambiguous.

Blood donor centers aim to attract potential donors and to provide blood that is as safe as current technology makes possible. Using PCR- and ELISA-based investigations in parallel, the blood donor centers confirm the results of each test, while avoiding false positive results, to ensure that the patient receives 'clean' blood. In addition, donations undergo a set of common serological screening and blood typing tests. Many of these tests are common throughout most European countries, although some authorities demand additional blood tests.

The Blood Donor Center at the University Clinical Center in Halle, Germany, handles 100-120 blood collections each day, from which different types of blood products are prepared, and used mainly to supply the University Clinical Center hospital. The Blood Donor Center's laboratory, led by Dipl. Biol. Angelika Stöcker, receives samples of each blood donation in barcode-labeled 13 mm tubes, which are immediately pooled using the Freedom EVO Clinical 150 workstation. The workstation is equipped with an 8-channel liquid handling arm for four disposable and four fixed tips, 1 ml syringes, a PosID™ barcode identification device and Logic software™. The connection to MAK-SYSTEM software allows remote communication with the workstation, eg. sending worklists to the Tecan platform from the central laboratory PC.

This liquid handling platform has been upgraded by the integration of the Te-PoolSafe module, an automated liquid arrival check system which uses a fast and sensitive balance to weigh the pooled samples, allowing blood banks to

Tecan Freedom EVO Clinical 150 workstation

Dispensing into the pooling tube on the Te-PoolSafe balance

monitor and evaluate the performance of their pooling application. The Te-PoolSafe measures the weight of every single dispense in each pool, and ensures full sample traceability by providing documented proof of performance. When inaccurately dispensed samples are detected, the whole pool is separately re-pipetted.

The samples are processed in groups of 16 tubes. After centrifugation, 400 µl of the serum is pipetted from each of the 16 samples and pooled, after which the pools are verified using the Te-PoolSafe module. In addition, three archiving microtiter plates are prepared in case the PCR needs to be repeated, as well as aliquots of each sample for long-term storage, and stored at -30 to -40 °C.

PCR-based tests are performed on the pools against the human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). Any PCR that gives a positive result is repeated and, if this confirms the initial positive result, two pools of eight samples are prepared from the original 16 samples for a further PCR-based test, and then each of the eight sera from the pool that returned a positive result are individually tested. ELISA-based tests are also performed to confirm the results obtained by PCR, as well as for antibodies against human cytomegalovirus and *Treponema pallidum*.

Before automation of the pooling process, the operator visually inspected the correct pool volume, whereas with the Te-PoolSafe, the 16 sample data of each pool are automatically read by the PosID barcode reader and, after pooling, a report is printed out showing the weight of every single dispense. Backed up with documented evidence, the operator can be certain that the correct volumes of every sample have been included in each pool. Unlike the manual procedures used previously, extra personnel are not needed to watch the operator's pooling procedure, so automation of blood pooling has yielded more walkaway time, and has freed up personnel to perform other duties.

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

Close-up view of the Te-PoolSafe balance dispensing sera into the pooling tube