

The Right Choice for the Job

The QUADRIGA™- System in blood donation analysis

Mauro Graziani, Dr. Christoph Niederhauser, Donation Analysis Lab, Blood Donation Centre, Bern



Mauro Graziani with the QUADRIGA System, right: Plate Station.

The QUADRIGA-System has been established in the Donation Analysis Lab at the Blood Donation Center in Bern since June 2002. QUADRIGA is a fully automated solution that screens for infection markers in donor and patient blood samples on microplates. This is an excellent example of integration engineering of Tecan instruments with other analytical instrumentation. It replaces the FAME and ATplusSystems by Hamilton which had been in use since 1994.

The purpose of the system

With the QUADRIGA we test each sample for HBs antigen, anti-HIV, anti-HCV and, for donor samples coming from Lausanne, we additionally test for anti-CMV. The system also pipettes the microplates for the

alanineaminotransferase (ALAT) assay. ALAT is a marker for liver inflammation. The ALAT assay is then run on a different system.

Installation of the QUADRIGA-System

Since the device needs an air conditioned room with a minimum of 24 sqm we had to move our reference lab. After that we began to prepare the room: air conditioning, water, drainage, electricity etc. had to be set up. In mid-April we began the system installation, which was followed by a test and verification phase. After thorough tests the system became fully operational on June 11th 2002.

The four QUADRIGA components

Four components from different manufacturers complete the QUADRIGA-System. All of these

have been used as stand-alone units for some time in many labs. The innovation of QUADRIGA is the combination of these four components, which are:

1. Plate station

All plates are pre-positioned here. Identification of plates is guaranteed through barcoding. After processing, the plates are also stored in this unit.

2. ORCA robot arm

ORCA is a fully maneuverable robot arm running on a three meter rail. The arm transports the plates from the plate station to the pipetting station. After pipetting it moves the plates into the analyzers and when the analysis is complete the plates are again placed in the plate station for storage.

3. Pipetting stations

Two Genesis RSP 200 are used as pipetting stations. These devices handle all preparatory pipetting steps and also add the required reagents to the right wells.

4. Analyzers

Four BEP® III (DADE Berhing) are used as analyzers. Additionally a fifth BEP III is built in as a backup device. However, only four devices are loaded by the ORCA arm. Each of the BEP III and also both Genesis RSP 200s are operated by a PC. Supervision of the whole process is handled by a host computer system which runs on Tecan's FACTS software.

Productivity and throughput

With the current settings each Genesis RSP 200 can perform a maximum of four pipetting steps on 720 samples per run, which adds up to a total of 5,760 pipetting steps. However, this number is limited by the BEP analyzers which can incubate a maximum of ten microplates at a time. With 88 samples per plate this adds up to a total of 3,530 analyses per run for the whole QUADRIGA-System. If fully loaded, one run takes approximately five hours, not including

approximately 1.5 hours for sample and system preparation. This seemingly long preparation time decreases as staff become familiar with the procedure. The overall maximum number of samples to be processed and analyzed (four tests) in 6.5 to 7 hours is 880. Several modifications can increase this amount to 1,200 samples, however, this would mean that the system is operating at the absolute maximum capacity and with this large amount of samples handled the slightest problem could lead to serious delays.

Operating the QUADRIGA System

Operating the individual components is fairly easy and intuitive to learn. The complete system operations, when used on a routine basis, can be learned within a few days. A basic knowledge and understanding of computers is however essential. Currently we have trained two "superusers" who not only have a thorough understanding of the system but were also trained on the individual components. Our goal is that all users of the system eventually reach the same level of knowledge

Conclusion

After several months of working with the QUADRIGA-System we have eliminated all the initial teething problems that are normal when setting up a new system of this size. We are confident that establishing the QUADRIGA-System in our lab was the perfect choice. With a system of this size we are now well prepared for the forthcoming challenges in analyzing infection markers in blood samples.

The QUADRIGA-System was developed in collaboration with Dade Behring.

Mauro Graziani, Dr. phil.nat.
FAMH Christoph Niederhauser
Blutspendedienst SRK Bern AG
Murtenstraße 133 CH-3008 Bern
T: +41-31 384 2374, F: +41-31 384 2381
mauro.graziani@bsd-be.ch



The two Genesis RSP 200 units in the QUADRIGA System.



Mauro Graziani with the BEP III.

**Fully automated
blood donation sample
analysis with QUADRIGA**