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J.J. Gonzalez[1], C.W.Y. Chan[2], L.S.M. Henderson[2], E. Rozek[3], D.C. Robson[2], M.A. Campbell[3], J.S. Robb[2] and R.F. Clayton[2].
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Evaluation of the MosaiQ™ Serological Disease Screening Microarray System for Detection of Antibodies to Human Cytomegalovirus and *Treponema pallidum*

Objective

The MosaiQ System is a proprietary, multiplex microarray technology which has the capability to combine serological blood typing (blood grouping and antibody detection/reverse typing) and both serological and molecular disease screening on a single high throughput automated platform. The system consists of the MosaiQ 125 Instrument and MosaiQ Magazines each containing 250 single use microarrays, associated system liquids and controls. Testing of donations for infectious disease markers is an essential part of ensuring the safety of the blood supply chain before donor blood is administered to patients. MosaiQ SDS Microarrays enable the qualitative screening of blood donations for the detection of IgG and IgM antibodies to Cytomegalovirus (CMV) and *Treponema pallidum (T. pall)* in human serum and plasma. The study was performed to demonstrate that the MosaiQ SDS Microarray meets the specificity and sensitivity levels required for CMV and *T. pall* blood donation testing via a comparative evaluation performed at three US donor testing sites. Figure 1 shows images of the MosaiQ 125 instrument, construction of the microarray and an image of the MosaiQ TM SDS Microarray well layout.

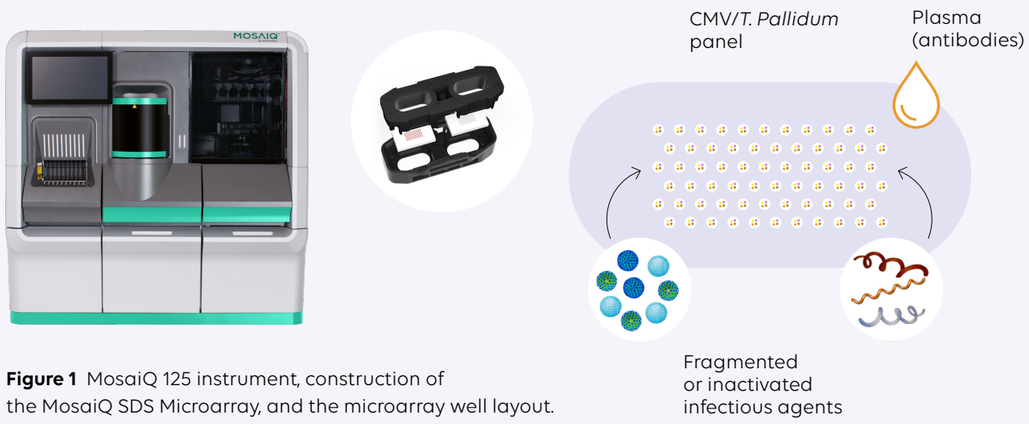


Figure 1 MosaiQ 125 instrument, construction of the MosaiQ SDS Microarray, and the microarray well layout.

Methods

MosaiQ SDS Magazines were manufactured by a fully automated manufacturing system, in compliance with GMP. In brief, chemically treated glass was printed with antigens in defined 'spots' prior to a proprietary treatment process, and then cut into small glass pieces and assembled into a plastic microarray construct as shown in Figure 1. Following the manufacture of microarrays, the automated manufacturing system then assembled magazines each containing 250 microarrays, which were then packaged into a protective packaging ready for use following quality control testing and release. The study involved testing samples on the MosaiQ system and comparator system (Beckman Coulter PK7300) with the following sample types: random donor samples, known repeat reactive seropositive Syphilis *(T. pall)* samples and well characterized *T. pall* positive samples (included due to low level of population seropositivity for *T. pall*). Random donor samples were EDTA whole blood (plasma) and non-anticoagulated (serum) samples, obtained from blood donations. Plasma or serum, diluted in system diluent, was added to microarrays for incubation, then aspirated and washed. Bound antibody was detected using a blend of Anti-IgG/IgM followed by a detection reagent. All samples were tested in parallel on comparator assays using recommended test procedures. Comparator testing for antibodies to CMV and *T. pall* was performed on 5011 and 5005 samples respectively. See Figure 2. for a schematic of the testing.

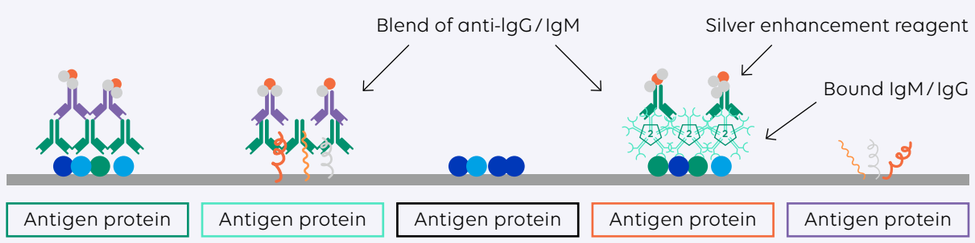
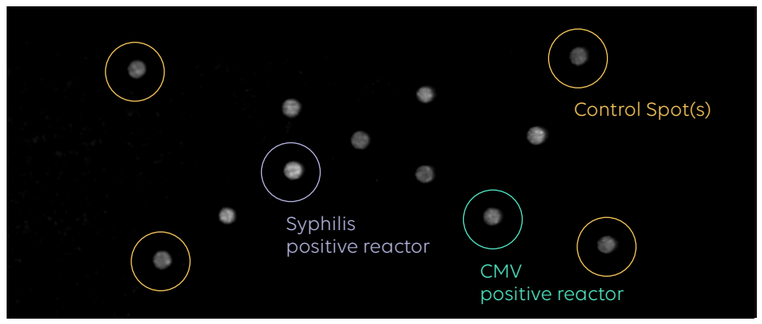


Figure 2 Testing schematic on MosaiQ system

Results

Figure 3 Typical microarray image from MosaiQ SDS Microarray analysis (not visible to user) showing control spots used for controls and positioning, and positive reactor spots for both *T. pall* (Syphilis) and CMV.



Reproducibility study

A reproducibility/precision study was executed at three US blood collection facilities. Three lots of magazines and 15 serological panel members were used for each assay. Fifteen plasma panel members were used: three high *T. pall* antibody titer, three low *T. pall* antibody titer; three high CMV antibody titer, three low CMV antibody titer, and three negative for both disease agents. At each site, each sample was tested three times per run, on three magazine lots, two runs per day separated by at least two hours, on at least ten non-consecutive days. The summary reproducibility performance is show in Table 1.

Table 1
Summary performance: reproducibility study

Assay	Reactivity	Obtained Result
Antibody to *T. pall*	Reactive samples	99.9%
	Non-reactive samples	98.4%
	Overall percentage agreement	99.4%
Antibody to CMV	Reactive samples	100.0%
	Non-reactive samples	99.1%
	Overall percentage agreement	99.8%

Comparator study

A performance evaluation/comparator study was performed at three US sites, using random donor samples, and compared to other established licensed methods. The summary performance is shown in Table 2.

Table 2
Summary performance: comparator study

Comparator Study Testing Arm	Sensitivity	Specificity
Random Donor CMV	98.0%	93.9%
Random Donor *T. pall*	–	99.7%
Well Characterized samples *T. pall*	97.0%	–
Known Repeat Reactive samples *T. pall*	99.5%	–

Conclusions

The study demonstrated that the MosaiQ platform is suitable for screening of blood donations for antibodies to CMV and *T. pall*. The platform demonstrated suitable sensitivity and specificity to be considered fit for its intended purpose, and has subsequently been submitted for consideration by regulatory bodies. Quotient is expanding the range of disease screening assays available on the MosaiQ platform to include HIV 1&2, HTLV, HBV, HCV and *T. cruzi*. The MosaiQ system has also successfully demonstrated that blood typing (antigen typing and antibody detection) and molecular disease screening can be performed using this proprietary instrument platform.

Affiliations
[1] Quotient Biodiagnostics. 301 South State Street, Suites S-204, Newtown, Pennsylvania, USA 18940
[2] Quotient Limited. 5 James Hamilton Way, Penicuik, Scotland UK EH260PL
[3] Quotient Suisse SA. Business Park Terre Bonne, Route de Crassier 13, Eysins, Switzerland 1262