Comparison of MRSA plate-reading methods: APAS® Independence (Artificial Intelligence), plate-in-hand and Kiestra™ (digital reads)

[1]Moore C, [2]Morales M, [1]Holds J, [1]Diep K, [2]Giglio S*

[1]SA Pathology, Adelaide, South Australia.

[2]LBT Innovations, Adelaide, South Australia.

**presenting author*

Background

Automation in Microbiology has progressed in recent years, primarily via robotics to reduce manual handling. While some steps in the culture plate workflow have been automated the plate reading step is still highly reliant on manual labour, reviewing plates in hand or reviewing images on screen. As demand for testing increases an ongoing shortage of microbiologists provide further challenges for labs to meet increasing demand with limited resources.

Instruments such as the APAS® Independence have the potential to provide microbiology laboratories with a greater level of consistency, traceability and reliability. The APAS® Independence may also decrease workload allowing scientific staff to focus on high-value tasks.

This evaluation was performed to assess how well the APAS® Independence system evaluated MRSA cultures on chromogenic media compared to Kiestra™ ReadA Browser image read and plate in hand (manual) reads.

Figure 1: APAS® Independence Instrument

Method

A total of 500 samples were plated onto bioMérieux ChromID®MRSA media. The samples composed of 450 remnant MRSA screening swabs along with nose, groin and axilla swabs and 50 known MRSA samples which were diluted and used to contrive 50 clinical remnant samples. All samples were plated using the BD Kiestra™ Automated System. Plates were incubated at 35°C aerobically in BD Kiestra™ ReadA Compact and assessed at 24 and 48 hours.

Three plate reading methods were used for interpretation: plate in hand, BD Kiestra™ and APAS® Independence. The plate in hand method was considered to be the "gold standard" for the analysis of results as it is the conventional plate reading standard. The BD Kiestra™ method was performed using BD Kiestra™ imaging systems and a scientist (microbiologist) to read the digital images from a screen, while the APAS® Independence method was performed using the APAS® Independence system.

Discrepant results were defined as any difference seen in any of the three reading methods. Any discrepant results requiring resolution across all three reading methods were resolved by identification using MALDI-TOF and susceptibility patterns.

Results

At 24 hours:

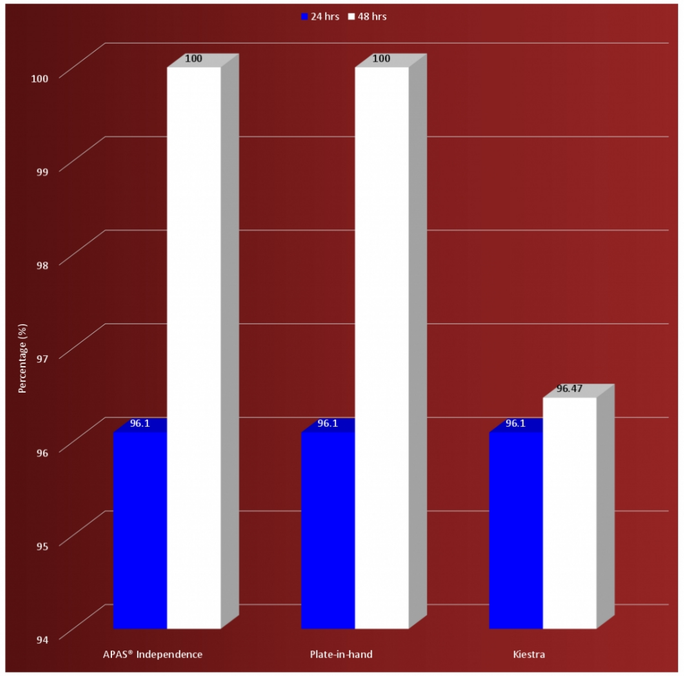
- APAS® Independence, BD Kiestra™, and plate in hand returned a sensitivity result of 96.61% (95% CI: 88.29%-99.59%).
- The specificity for APAS® Independence was 98.08% (95% CI 96.4%- 99.12%). Specificity for BD Kiestra™ and plate in hand was 99.57% (95% CI: 98.47%-99.95%) when compared to the "gold standard".

At 48 hours:

- APAS® Independence and plate in hand had a sensitivity of 100% (95% CI: 95.75%-100%). Kiestra™ had a sensitivity of 96.47% (95% CI: 92.33%-96.69%)
- APAS® Independence had a specificity of 94.81% (95% CI: 92.33% – 96.69%) while plate in hand had a specificity of 93.47% (95% CI: 90.75% – 95.58%). Kiestra™ had a specificity of 93.02% (95% CI: 90.24%-95.21%).

Results

FIGURE 2: Sensitivity results



Conclusion

A total of 500 samples were plated onto bioMérieux ChromID®MRSA media. The study demonstrated that there is an inherent human error when reading plate in hand (manual plate reading). All three methods showed a tendency to error on the side of caution and overcall positive plates. APAS® Independence shows a higher degree of sensitivity and specificity at 48 hours when compared to the gold standard.